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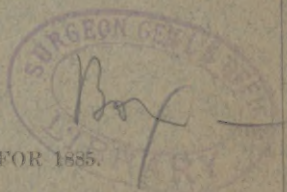
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AN ACCOUNT OF THE PROGRESS
IN
CHEMISTRY
IN
THE YEAR 1885.

BY

H. CARRINGTON BOLTON, PH. D.,
PROFESSOR OF CHEMISTRY, TRINITY COLLEGE, HARTFORD.

FROM THE SMITHSONIAN REPORT FOR 1885.



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Professor of Chemistry, Trinity College, Hartford.

GENERAL AND PHYSICAL.

Present Aspects of the Theory of Chemical Action.—In his presidential address to the chemical section of the British Association for the Advancement of Science, at the Aberdeen meeting, Prof. Henry E. Armstrong considered, among other things, the present aspects of the theory of chemical action. He said: Chemical action may be defined as being any action of which the consequence is an alteration in molecular constitution or composition; the action may concern molecules which are of only one kind—cases of mere decomposition, of isomeric change, and of polymerization; or it may take place between dissimilar molecules—cases of combination and of interchange. Hitherto it appears to have been commonly assumed and almost universally taught by chemists that action takes place directly between A and B, producing AB, or between AB and CD, producing AC and BD, for example. This, at all events, is the impression which the average student gains. Our text books do not, in fact, as a rule deign to notice observations of such fundamental importance as those of De La Rive on the behavior of nearly pure zinc with dilute sulphuric acid, or the later ones of Faraday (*Exp. Researches*, Series VII, 1834, 863 *et seq.*) on the insolubility of amalgamated zinc in this acid. Belief in the equation $\text{Zn} + \text{H}_2\text{SO}_4 = \text{H}_2 + \text{ZnSO}_4$, hence, becomes a part of the chemist's creed, and it is generally interpreted to mean that zinc *will* dissolve in sulphuric acid forming zinc sulphate, not, as should be the case, that *when* zinc dissolves in sulphuric acid it produces zinc sulphate, &c.

In studying the chemistry of carbon compounds we become acquainted with a large number of instances in which a more or less minute quantity of a substance is capable of inducing change in the body or bodies with which it is associated without apparently itself being altered. The polymerization of a number of cyanogen compounds and of aldehydes, the “condensation” of ketonic compounds and the hydrolysis of carbohydrates are cases in point, but so little has been done to ascertain

the nature of the influence of the contact-substance, or *catalyst*, as I would term it, the main object in view being the study of the product of the reaction, that the importance of the catalyst is not duly appreciated. Recent discoveries, however—more particularly Mr. H. B. Dixon's invaluable investigation on conditions of chemical change in gases, and the experiments of Mr. Cowper with chlorine and various metals, and of Mr. Baker on the combustion of carbon and phosphorus—must have given a rude shock, from which it can never recover, to the belief in the assumed simplicity of chemical change. The inference which I think may be fairly drawn from Mr. Baker's observations—that *pure* carbon and phosphorus are incombustible in *pure* oxygen—is indeed startling, and his experiments must do much to favor that “more minute study of the simpler chemical phenomena” so pertinently advocated by Lord Rayleigh. (See Presidential Address to the B. A. A. S., at the meeting of 1884.)

But if it be a logical conclusion from the cases now known to us, that chemical action is not possible between any two substances other than elementary atoms, and that the presence of a third is necessary, what is the function of the third body, the catalyst, and what must be its character with reference to one or both of the two primary agents? In the discussion which took place at the chemical society after the reading of Mr. Baker's paper, I ventured to define chemical action as *reversed electrolysis*, stating that in any case in which chemical action was to take place, it was essential that the system operated upon should contain a material of the nature of an electrolyte (*Chem. Soc. Proc.*, 1885, p. 40). In short, I believe that the conditions which obtain in any voltaic element are those which must be fulfilled in every case of chemical action. There is nothing new in this; in fact it was stated by Faraday in 1848 (*Exp. Researches*, series VII, § 858 and § 859); and had due heed been given to Faraday's teaching, we should scarcely now be so ignorant of the conditions of chemical change. (*Chem. News*, LII, 135.)

Suggestions as to the Cause of the Periodic Law and the Nature of the Chemical Elements. (By Prof. Thomas Carnelley.)—The truth of the periodic law of the chemical elements is now generally allowed by most chemists. Nevertheless, but little has been done towards attaining a reasonable explanation of the law. This prompts the author to offer a few suggestions on this subject. Even long before the discovery of the periodic law many chemists had pointed out certain numerical relationships existing between the atomic weights of bodies belonging to a given group, and had, hence, supposed that the elements belonging to the several natural groups were not primary, but were made up of two or more simpler elements. These conclusions, however, were more or less fragmentary and referred only to particular groups of elements. In the light of the periodic law the author has made a general extension of the fragmentary conclusions of Dumas, and has brought that law into jux-

taposition with an extended generalization of the analogy of the elements with the hydrocarbon radicals. A careful consideration of the relations between certain physical properties and the atomic weights of the elements leads almost irresistibly to the conclusion that the elements are analogous to the hydrocarbon radicals in both form and function. This is a conclusion which if true would further lead us to infer that the elements are not elements in the strict sense of the term, but are built up of (at least) two primary elements, A (=carbon at. wt. 12) and B (æther, at. wt.—2), which by their combination produce a series of compounds (viz, our present elements) analogous to the hydrocarbon radicals. If this theory be true the periodic law follows as a matter of course, and we should therefore be able to represent the elements by some such general formula as $A_n B_{2n+(2-x)}$, analogous to that for the hydrocarbon radicals $C_n H_{2n+(2-x)}$ in which n =the series and x the group to which the element or hydrocarbon radical belongs. Assuming the truth of the theory here advanced, it is interesting to observe that whereas the hydrocarbons are compounds of hydrogen and carbon, the chemical elements would be composed of carbon with æther, the two sets of bodies being generated in an exactly analogous manner from their respective elements. There would, hence, be three primitive elements, viz, carbon, hydrogen, and æther. Finally, this theory would remove the chief objections which have been urged against the periodic law, whilst the existence of elements of identical atomic weights and isomeric with one another would be possible. May not Ni and Co, Ru and Rh, Os and Ir, and some of the rare earth metals be isomers in this sense? (Report B. A. A. S. in *Nature*, XXXII, 539.)

Relations between the Atomic Weights and the Physiological Functions of the Elements (by Fausto Sestini).—A study of the following table containing the elements entering into the formation of the organic matter of plants, shows that no element having an atomic weight higher than 56 takes a direct part in producing organic bodies:

	<i>Indispensable.</i>	<i>Useful.</i>
Electro-negative	{ C=12; N=14; O=16; P=31; S=32	{ Si=28; Cl=35.5.
Electro-positive	{ H=1; Mg=24; K=39; Ca=40; Fe=56	{ Na=23; Mn=55.

Among the remaining elements of the first four groups of the periodic system which occur in the ashes of certain plants are Al=27.3 in lycopodium and equisetum, Li=7 in tobacco and vines, Fl=19 in many higher plants, Cu=63, Zn=65, and Br (also I) in algæ. The elements following copper up to uranium act like poison upon plants and animals. The soluble compounds of most of the elements having higher atomic weights than 56 coagulate albumen, exert a very injurious influence on animals, and act to a certain extent as antiseptics. (*Gazz. chim. italiana*, xv, 107.)

On the Unit used in Calculating the Atomic Weights (by Lothar Meyer and Karl Seubert).—The controversy arising immediately after the proposal of Dalton's atomic theory, as to the unit upon which the numerical values of the atomic weight should be based has for half a century divided chemists into two schools. While Dalton and, later, Leopold Gmelin, from theoretical and philosophical considerations, chose the smallest atomic weight, that of hydrogen, as the measure of all the rest, Wollaston and Berzelius chose that of oxygen, partly because they did not place so high a value on theoretical views, and partly on the purely practical ground that many elements can be compared directly with oxygen, whereas they can be only indirectly compared with hydrogen. When the Dalton unit, the hydrogen atom, gradually obtained the upper hand, the old controversy appeared to have been laid aside, and consequently it was to be hoped that the recent more exact investigations of the laws which govern the numerical values of the atomic weights would be directed from the same point of view. This hope, however, has unfortunately not been fulfilled, as the old Wollaston-Berzelius unit has lately again come into use in a different—and as we believe—more dangerous form.

As is well known, J. S. Stas has from his own observation as well as those of others deduced as the most highly probable result that the atomic weight of oxygen is not quite sixteen times as great as that of hydrogen, but on the contrary is about $\frac{1}{400}$ of its value less than 16 H. That is when $H=1$, $O=15.96$. Many chemists, however, content themselves with numerical values founded on the more simple ratio of $H:O=1:16$, regarding the difference of $\frac{1}{400}$ as of very little practical consideration. And the hope that the old controversy over the choice of the unit would disappear upon a recalculation of the atomic weights has unfortunately not been fulfilled. The desire to do away with the unit $O=100$ is universal; all chemists prefer referring atomic weights to hydrogen, but they do not agree as to the way in which this is to be done. Some refer all atomic weights to $O=16$, when $H=1.0023$, and others to $H=1$. In consequence of these different views all the other atomic weights fluctuate to the extent of about $\frac{1}{4}$ per cent. of their value, a very undesirable state of affairs, leading to confusion and perplexity. The authors maintain that the real cause prompting the adoption of $O=16$ is a secret fondness for Prout's hypothesis.

The authors admit that the error introduced by making $O=16$ is much smaller than the unavoidable errors of observation so far as *inorganic* compounds are concerned, but they show that in the analysis of *organic* compounds it is quite otherwise. From a table showing the percentages of hydrogen and carbon in the paraffins containing 30 and 31 carbon atoms and their derived alcohols and acids, it is evident that the variations in the calculated percentages of carbon dioxide reach the tenths of a per cent., a difference often greater than that obtained from two adjacent hydrocarbons in a homologous series.

With the aid of a second table, in which calculations are made on the two suppositions that $O=16$, and $O=15\cdot96$, the authors show that according to the former a given analysis would lead to the formula $C_{25}H_{32}$, but according to the latter the formula would be $C_{27}H_{56}$. Of course in such a case no one would determine the formula by analysis alone. In conclusion, the authors say: "We are all convinced that the relation under consideration (and thereby every other atomic weight referred to $H=1$) is not accurate to the thousandth part of its value. Let us accept it without artificial interpretations and wait till the future for its further proof and confirmation by experimental methods." (*Ber. d. chem. Ges.*, XVIII, 1089, and *Am. Chem. J.*, VII, 96.)

Prout's Hypothesis and the Atomic Weight of Silver (by Lothar Meyer and K. Seubert).—The calculation of the atomic weights of many of the elements depends, as is well known, upon that of silver, so that the sharpest possible determination of this is desirable in order to obtain accurate results, without which a discussion of Prout's hypothesis, as far as this is concerned with facts, is unprofitable. For this reason J. S. Stas, in his masterly investigations, used the utmost care in determining the stoichiometrical relations between silver and oxygen. Dumas, in 1878, showed that oxygen was contained in pure silver which had been fused with borax and saltpeter. The authors have studied the influence which the slight percentage of oxygen may have exerted on Stas' silver determinations, and conclude that the latter were not appreciably influenced by the occluded oxygen. The authors maintain that the most accurate determinations of atomic weights of the elements all contradict Prout's hypothesis in its characteristic original conception; it must therefore be looked upon as having been disproved by experiment. (*Ber. d. chem. Ges.* XVIII, 1098, and *Am. Chem. J.*, VII, 104.)

Re-determinations of Atomic Weights.

Element.	Atomic weight.	Authority.	Reference.
Cerium	141·1	Crookes	Chem. News, LII, 302.
Lanthanum	133·3	do	Do.
Carbon [$O=16$]	12·0	van der Plaats	Comptes rendus, c, 52.
Phosphorus [$O=16$]	31·0	do	Do.
Tin [$O=16$]	118·07	do	Do.
Zinc [$O=16$]	65·17	do	Do.
Titanium	48·01	T. E. Thorpe	Chem. News, LI, 46.
Bismuth	208·16	R. Schneider	J. prakt. Chem., xxx.
Glucinum	9·1	Humpidge	Chem. News, LI, 121.
Samarium	150·02	Cleve	Chem. News, LI, 145.
Didymium	142·3	do	Chem. News, LII, 227.
Cerium [$O=16$]	140·22	Brauner	J. Chem. Soc., 1885, 879.

Physical Conditions Dependent upon Temperature.—The experiments of French and of Russian chemists in liquefaction of gases, and the extraordinary temperatures obtained, excite so much interest that we here transcribe a somewhat extended table of temperatures with attendant phenomena. The table was compiled by Mr. J. J. Coleman, and presented by him to the Philosophical Society of Glasgow, March 18, 1885, in connection with his paper on the "Liquefaction of Gases, and other Effects of Extreme Cold." (See *Chem. News*, LI, 174.)

Fahr.	Cent.	Physical conditions dependent on temperature.	Atmospheres.
+698	+370	Critical point of water	195.5
311	155.4	Critical point of sulphuric anhydride	78.9
285	141	Critical point of chlorine	83.9
266	130	Critical point of ammonia	115
212	100.2	Critical point of sulphuretted hydrogen	92
98	37	Critical point of acetylene	68
95	35.4	Critical point of nitrous oxide	75
89	31.9	Critical point of carbon dioxide	77
50	10.1	Critical point of ethylene	51

Fahr.	Cent.	Physical conditions dependent on temperature.	Authority.
+ 32	0	Nitrous oxide boils at 32 atmospheres pressure ...	Faraday.
+ 32	0	Carbon dioxide boils at 36 atmospheres pressure..	Do.
+ 14	— 10	Sulphur dioxide boils	Do.
+ 15	— 10.5	.....do.....	Bunsen.
+ 10	— 23	Methyl chloride boils	Regnault.
— 10	— 23	Carbon dioxide boils at 19.38 atmospheres pressure.	Faraday.
— 20	— 29	Sulphur dioxide boils in current dry air	Pictet.
— 20	— 29	Carbon dioxide and oxygen, air and nitrogen compressed to 300 atmospheres in glass tubes and expanded suddenly show liquefaction.	Cailletet.
— 26	— 32	Alcohol containing 52 per cent. water freezes	Pictet.
— 29	— 33.6	Chlorine boils	Regnault.
— 29	— 33.7	Ammonia boils	Bunsen.
— 31	— 35	Commercial paraffin oil (sp. gr. 0.810) freezes	Coleman.
— 40	— 40	Nitrous oxide boils at 8.71 atmospheres pressure..	Faraday.
— 40	— 40	Carbon dioxide boils at 11 atmospheres pressure..	Do.
— 40	— 40	Ethylene boils at 13.5 atmospheres pressure	Do.
— 53	— 47	Holland gin and French brandy freeze	Coleman.
— 60	— 51	Nitrous oxide boils at 5 atmospheres pressure	Faraday.
— 60	— 51	Carbon dioxide boils at 6.75 atmospheres pressure ..	Do.
— 60	— 51	Ethylene boils at 9 atmospheres pressure	Do.
— 62	— 52	American petroleum (sp. gr. .790) freezes	Coleman.
— 62	— 52	Extra-strong whisky and rum freeze	Do.
— 62	— 52	Alcohol containing 40 per cent. water freezes	Do.
— 80	— 61.8	Sulphydic acid boils	Regnault.
— 80	— 62	Nitrous oxide boils at 3 atmospheres pressure	Faraday.
— 80	— 62	Carbon dioxide boils at 3.75 atmospheres pressure..	Do.
— 80	— 62	Ethylene boils at 6.5 atmospheres pressure	Do.
— 99	— 73	Critical point of marsh gas, 56 atmospheres pressure.	Wroblewski.
— 103	— 75	Liquefied ammonia freezes	
— 103	— 75	Alcohol containing 20 per cent. water freezes	Coleman.
— 108	— 78	Carbon dioxide boils	Faraday and Regnault.
— 112	— 80	Solid sulphurous anhydride melts	Mitchell.
— 123	— 86	Nitrous oxide boils	Faraday.

Fahr.	Cent.	Physical conditions dependent on temperature.	Authority.
—123	— 86	Marsh gas boils at 40 atmospheres pressure.....	Wroblewski.
—128	— 87.9	Liquid nitrous oxide boils.....	Regnault.
—144	— 98	Marsh gas boils at 25 atmospheres pressure.....	Wroblewski.
—152	—102	Amyl alcohol, an oily liquid.....	Olzewski.
—152	—102	Silicon fluoride, a white mass.....	Do.
—152	—102	Arsenated hydrogen liquid.....	Do.
—152	—102	Hydrochloric acid boils.....	Do.
—152	—102	Chlorine in orange crystals.....	Do.
—152	—102	Ethylene boils.....	Wroblewski.
—154	—103	do.....	Olzewski.
—166	—110	Solid carbon dioxide and ether in vacuo.....	Faraday.
—171	—113	Critical point of oxygen, 50 atmospheres pressure.....	Wroblewski.
—171	—113	Marsh gas boils at 16 atmospheres pressure.....	Do.
—175	—115	Solid carbon dioxide in vacuo, 25 ^{mm} pressure.....	Dewar.
—175	—115	Hydrochloric acid a solid.....	Olzewski.
—177	—116	Carbon disulphide a solid.....	Do.
—180	—118	Arsenated hydrogen in white crystals.....	Do.
—193	—125	Nitrous oxide boils in vacuo.....	Dewar.
—200	—129	Ether solidifies.....	Olzewski.
—202	—130	Absolute alcohol a solid.....	Do.
—209	—134	Amyl alcohol a solid.....	Do.
—218	—139	Ethylene boils in vacuo.....	Do.
—219	—139.5	Critical point of carbon monoxide, 35.5 at pressure.....	Do.
—220	—140	Critical point of air, pressure 39.0 atmospheres.....	Do.
—220	—140	Calculated temperature of carbon dioxide snow in vacuo.....	Pictet.
—220	—140	Hydrogen compressed to 650 atmospheres and pressure released produces momentary liquefaction and solidification.....	Do.
—220	—140	Oxygen compressed to 320 atmospheres and pressure released produces momentary liquefaction.....	Do.
—231	—146	Critical point of nitrogen, 35 atmospheres pressure.....	Olzewski.
—238	—150	Ethylene boils in vacuo.....	Do.
—238	—150	Carbon dioxide boils at 20 atmospheres pressure.....	Do.
—242	—152	Atmospheric air boils at 20 atmospheres pressure.....	Do.
—247	—155	Marsh gas boils.....	Wroblewski.
—299	—184	Oxygen boils.....	Do.
—312	—191.4	Air boils.....	Olzewski.
—312	—191.2	do.....	Wroblewski.
—315	—193	Carbon monoxide boils.....	Do.
—317	—194	Nitrogen boils.....	Olzewski.
—336	—205	Air boils in vacuo.....	Do.
—348	—211	Carbon monoxide solidifies.....	Do.
—351	—213	Nitrogen boils in vacuo.....	Do.
(?)	(?)	Hydrogen at 100 to 200 atmospheres liquefies to colorless drops (in glass tubes 0.2 ^{mm} diameter surrounded by oxygen boiling in vacuo).	Wroblewski and Olzewski.
—355	—215	Calculated boiling point of hydrogen.....	E. J. Mills.
—460	—273	Absolute zero.....	

Compare note on solid nitrogen under the head "Inorganic."

Anomalies in the Boiling Points of the Chloroaceto-nitrils and their Derivatives (by Hermann Bauer).—As a rule the replacement of hydrogen by chlorine or by oxygen lowers the volatility of organic compounds not inconsiderably, but in certain cases an opposite effect results. Such an abnormal effect is especially noticed in cyanogen compounds, the volatility of which is usually increased by the introduction into the molecule of negative radicals, and this occurs even when the molecular weight is

greatly increased. Chlorocyanogen and dicyanogen, for example, are more volatile than hydrocyanic acid:

H—CN boils at $+26^{\circ}$

Cl—CN boils at $+15^{\circ}$

NC—CN boils at -21°

and cyanethyl boils at 96° , higher than cyanacetyl, which boils at 93° C. The chloronitrils exhibit similar peculiarities. These and similar facts prompted the author to examine the influence on the boiling point of introducing atomic groups in the place of the chlorine in those bodies in which the chlorine itself produces no change or marked change in the volatility. To this end the author prepared the four nitrils named below; their formula, and boiling points compared with trichloroacetonitril, are given in the table:

Name.	Formula.	B. P.	Difference.
Trichloroacetonitril	$\text{CCl}_3\text{—CN}$	84	
Dichloromethoxyacetonitril	$\text{CH}_3\text{O—CCl}_2\text{—CN}$	148	—64
Dichlorethoxyacetonitril	$\text{C}_2\text{H}_5\text{O—CCl}_2\text{—CN}$	161	—13
Dichloropropoxyacetonitril	$\text{C}_3\text{H}_7\text{O—CCl}_2\text{—CN}$	182	—21
Dichloromonoisobutoxyacetonitril	$\text{C}_4\text{H}_9\text{O—CCl}_2\text{—CN}$	196	—14

Whence it appears that the replacement of chlorine by methoxyl raises the boiling point 64° , and beyond this the boiling point increases with each addition of the carbon group in about the same ratio as in homologous compounds of like character.

In the compounds cited below, an unusual elevation of the boiling point occurs when oxymethyl enters.

Name.	Formula.	B. P.	Name.	Formula.	B. P.
Phosgene	$\text{CO} \begin{Bmatrix} \text{Cl} \\ \text{Cl} \end{Bmatrix}$	$+ 8^{\circ}$	Carbonic methyl ether.	$\text{CO} \begin{Bmatrix} \text{OCH}_3 \\ \text{OCH}_3 \end{Bmatrix}$	91°
Chlorocarbonic-methyl ether.	$\text{CO} \begin{Bmatrix} \text{Cl} \\ \text{OCH}_3 \end{Bmatrix}$	67°			
Chloroform	CHCl_3	61	Orthoformic-methyl ether.	$\text{CH}(\text{OCH}_3)_3$	102°
Cyanchloride	NCCl	15.5	Cyanomethyl ether.	NCOCH_3	43–45
Trichloroacetonitril.	NC—CCl_3	84	Dichloromethoxyacetonitril.	$\text{NC—CCl}_2\text{OCH}_3$	148

In some cases the boiling point rises regularly 20° for each CH_2 introduced into the compound.

Name.	Formula.	B. P.
Dichloropropoxyacetonitril	$\text{CCl}_2(\text{OC}_3\text{H}_7)\text{CN}$	183
Monochlorodipropoxyacetonitril	$\text{CCl}(\text{OC}_3\text{H}_7)_2\text{CN}$	200
Tripropoxyacetonitril	$\text{C}(\text{OC}_3\text{H}_7)_3\text{CN}$	218
Dichlorisobutoxyacetonitril	$\text{CCl}_2(\text{OC}_4\text{H}_9)\text{CN}$	195

In other cases a notable elevation of boiling point ensues when chlorine is replaced by ethoxyl.

Name.	Formula.	B. P.
Phosgene	$\text{CO} - \text{Cl}_2$	+ 8 °
Chlorocarbonicethyl ether	$\text{CO} - \text{ClO} - (\text{C}_2\text{H}_5)$	94
Carbonicdiethyl ether	$\text{CO} - (\text{OC}_2\text{H}_5)_2$	126
Chloroform	CHCl_3	61
Orthoformicethyl ether	$\text{CH} - (\text{OC}_2\text{H}_5)_3$	146
Carbontetrachloride	CCl_4	77
Orthocarbonicethyl ether	$\text{C} - (\text{OC}_2\text{H}_5)_4$	159
Trichlorethane	CH_3CCl_3	74.5
Orthoaceticethyl ether	$\text{CH}_3\text{C} - (\text{OC}_2\text{H}_5)_3$	142
Cyanogen chloride	$\text{NC} - \text{Cl}$	15.5
Isocyanicethyl ether	$\text{NC} - \text{OC}_2\text{H}_5$	60
Tricyanogen chloride	$\text{N}_3\text{C}_3\text{Cl}_3$	190
Isocyanuricethyl ether	$\text{N}_3\text{C}_3 - (\text{OC}_2\text{H}_5)_3$	276
Trichloracetoneitril	$\text{NC} - \text{CCl}_3$	84
Dichlorethoxylacetoneitril	$\text{NC} - \text{CCl}_2\text{OC}_2\text{H}_5$	161

In the following, however, we have an exception to the rule:

Name.	Formula.	B. P.
Monochlorodiethoxylacetoneitril	$\text{NC} - \text{CCl}(\text{OC}_2\text{H}_5)_2$	161 °
Triethoxylacetoneitril	$\text{NC} - \text{C}(\text{OC}_2\text{H}_5)_3$	161

It is evident that an exchange of chlorine methoxyl in many cases produces no change in the boiling point, and in some instances chlorine is equivalent to the ethoxyl group. This is true of the bodies prepared by the author; when once the atom of chlorine is replaced by ethoxyl the exchange of a second atom does not further influence the boiling point. (*Liebig's Annalen*, CCXXIX, 163.)

Radiant Matter-Spectroscopy; Samarium.—Mr. William Crookes has continued his remarkable researches in the entirely original field of radiant-matter-spectroscopy. The results obtained as respects yttrium were noticed in our report for 1883. In a paper read before the Royal Society June 18, 1885, Mr. Crookes details the results of a study of the beautiful spectrum characterized by a strong red and a double orange band, and which proves to be peculiar to samarium.

This double orange band spectrum was first observed by him in 1881, and his laborious researches have been uninterruptedly pursued since that date; the extreme sensitiveness of the new method of testing acted as a drawback rather than a help, except that the persistency of the phenomena observed increased confidence in its reliability. To the inexperienced eye one part of the "orange band" substance in ten thousand gives as good an indication as one part in ten, and by far the

greater part of the chemical work undertaken in the hunt for the spectrum-forming element was performed upon material which later knowledge showed did not contain sufficient to respond to any known chemical test. Except in few instances, as water analysis and the detection of poisons, chemistry takes little account of traces, and when an analysis adds up to 99.99 the odd 0.01 per cent. is conveniently put down to "impurities," "loss," or "errors of analysis." When however the 99.99 per cent. constitutes the impurity and this exiguous error 0.01 is the precious material to be extracted, and when, moreover, its chemistry is absolutely unknown, the difficulties of the problem become enormously enhanced. The author was therefore obliged to build up a new chemistry, and after six months' work he obtained the earth didymia in a state which most chemists would call absolutely pure, for it probably contained not more than one part of impurity in 500,000 of didymia. But this one part in half a million, profoundly affected the character of didymia from a radiant-matter-spectroscopic point of view, and the persistence of this very minute quantity of interfering impurity entailed another six months' extra labor to eliminate these final traces, and to ascertain the real reaction of didymia pure and simple. The earth formerly called didymia proved to be a mixture of didymia and samaria. During the long process of purification the 1,000 grams dwindled away bit by bit until less than one-half a gram remained of the pure material. Didymia thus purified shows no trace of the orange double band, which is characteristic of samarium, an element discovered in 1879 by Lecoq de Boisbaudran.

The earths ceria, lanthania, didymia, and samaria possess in their purest state the following characters: Ceric oxide is almost pure white; in strong solution it has no absorption spectrum. The atomic weight of the metal was taken and found to be 141.1. Ceria gives no orange band spectrum in the radiant-matter tube. Lanthana is snow white, and the metal was found to have an atomic weight of 138.3. It gives no orange band spectrum when absolutely free from samaria. Samaria is white, with the faintest possible tinge of yellow; its absorption spectrum is much more feeble than the spectrum of didymium. Pure samaric sulphate by itself gives a very feeble phosphorescent spectrum. When however the samaria is mixed with lime before examination in the radiant-matter tube, the spectrum is very beautiful, consisting essentially of three bright bands—red, orange, and green—these being nearly equidistant, and the orange being the brightest. With a narrower slit the orange and green bands are seen to be double, with faint wings.

The spectrum of samaria becomes highly modified by mixing with the earth other metallic oxides. Mr. Crookes divides these modified spectra into three groups; for particulars of each, with diagrams of each type, we refer to the original paper. In a mixture of samaria and yttria the former possesses a remarkable power of obliterating the spec-

trum of the latter; this holds even in a mixture of 43 parts samaria and 57 parts yttria. The delicacy of the spectrum test for samarium is extraordinary; a mixture of 1 part of samarium with 1,000,000 parts of calcium still exhibits a feeble spectrum of samarium; in a mixture of 1 to 2,500,000 parts the spectrum of samarium is nearly imperceptible.

A striking feature in the spectra of various mixtures of samaria and yttria is a brilliant and sharp orange line $\frac{1}{h_2} 2693$. So long as this bright line is a component of the spectrum the other bands manifest decidedly less intensity, and many of them are suppressed. The profound modification in the spectra of samaria and yttria developed by their mixture is undoubtedly without precedent in spectrum analysis. Mr. Crookes remarks in conclusion that the many anomalies unearthed in these researches teach that inferences drawn from spectrum analysis *per se* are liable to grave doubt, unless at every step the spectroscopist goes hand in hand with the chemist. Spectroscopy may give valuable indications, but chemistry must after all be the court of final appeal. (*Chem. News*, LI, 301.)

A New Kind of Metallic Spectra; Possible New Elements.—At the meeting of the French Academy of Sciences on June 8, 1885, M. Lecoq de Boisbaudran requested that a sealed packet which he had deposited June 30, 1884, might be opened. The packet was opened by the permanent secretary during the meeting and contained a note of which the following is a condensation. When the electric spectrum of a solution with a metallic base is produced, it is customary to make the outside platinum wire (whence the induction spark strikes) positive, the liquid consequently forming the negative pole. If the direction of the current be reversed, the metallic rays, due to the free metal or to one of its compounds, are scarcely visible or quite invisible, at all events so long as the exterior platinum wire now forming the negative pole is not coated with a deposit. In examining the rare earths belonging to the didymium and yttrium family, the writer observed with many of the preparations the formation of spectrum bands, nebulous but sometimes tolerably brilliant, having their origin in a thin layer of a beautiful green color, which was seen to appear at the surface of the liquid (a solution of a chloride) when it was rendered positive. The principal bands are six in number, situated as follows: $\lambda 620\frac{1}{2}$, $\lambda 585\frac{3}{4}$, $\lambda 573$, $\lambda 543\frac{1}{2}$, $\lambda 487$, $\lambda 476\frac{1}{2}$; some of these are nebulous and broad. That at $543\frac{1}{2}$ is probably not due to any known element, unless it proves to be due to holmium. That at 573 is also probably due to a new element. The latter yet unisolated body the author designates provisionally by $Z\alpha$, and the former by $Z\beta$.

M. Lecoq de Boisbaudran regards his "reversion spectrum" as physically analogous to the phosphorescent spectra obtained by Mr. Crookes at the positive pole in his high vacuum tubes containing certain compounds of yttria. [See our Report for 1883.]

To this note in the sealed packet the French chemist added the following: "I have not yet finished the very long work undertaken in the hope of determining the nature of the above-described phosphorescent spectrum. This spectrum is now recognized as identical with that ascribed to pure yttria by Mr. Crookes, and which this savant obtained under experimental conditions very different from mine. Nevertheless, my latest observations lead to the conclusion that yttria is not the cause of the spectrum bands observed. In my fractionations the phosphorescence spectrum regularly gets weaker as I advance towards the yttria end. With almost pure yttria the phosphorescence bands show themselves faintly or not at all, while they are brilliant with the earths which do not give, by the direct spark, the rays of yttrium to an appreciable extent. The prodigious sensitiveness of Mr. Crookes' reaction, which detects a millionth part of his purified yttria, makes very singular this divergence which I am obliged to point out between the conclusions of the eminent English chemist and myself." . . . "I should acknowledge here that Mr. Crookes was the first to see the phosphorescence spectrum of samarium." (*Comptes rendus*, c, 1437, and *Chem. News*, LII, 4.)

Quantitative Determination of Lithium by the Spectroscope.—L. Bell has found the following method gives good results: A standard solution was made from lithium carbonate converted to the chloride, containing .0265^{mgm} of Li₂O per cubic centimeter. Of this 10^{cc} were taken, diluted till the spectral line was just on the point of vanishing and the volume noted. Then the solution to be estimated was diluted to the same point and its volume compared with that of the standard, when a simple proportion gave the amount of Li₂O present. A very small loop of platinum wire should be used and applied to the same part of the Bunsen flame. The method is applicable to the analysis of lithium minerals, and examples are given. The method is useful also in case of thallium and such other elements as give distinct lines in the spectroscope. (*Am. Chem. J.*, VII, 35.)

Action of Light on Iodoform in Solution.—E. Fabini has observed that a solution of iodoform in benzine becomes bright red when exposed to direct sunlight for ten to twenty minutes, whereas in the dark it remains colorless. If a solution prepared in the dark is suddenly exposed to the rays of the sun it immediately turns to a splendid red color, and iodine is precipitated. Further experiments with solutions of iodoform in ether and in oils shows it to be very sensitive to light, being thereby reduced. (*Pharmaceutische Post*.)

On the Action of Light in Chemical Reactions (by D. Amato).—The author, in studying the action of light and of heat in chemical reactions, has obtained results of great interest; he shows that many of the decompositions and combinations attributed to the action of light

exclusively are in reality due to light and heat, or to the latter agent only. The decomposition of liquid phosphine is generally attributed to light, but the author shows that it can be exposed to direct sunlight at 10° without a trace of decomposition. Heat alone without light is inactive.

A mixture of chlorine and hydrogen can be exposed with impunity to sunlight if cooled to -12° C.; a temperature of 29° is not able to effect combination of the gases without sunlight. Chloride of silver requires both heat and light for its decomposition, and Fehling's solution is not changed by light alone; if organic dust be excluded the solution will keep indefinitely when exposed to full sunlight. (*Gazetta chimica italiana*, XIV, 57.)

INORGANIC.

Manufacture of Oxygen and of Ammonia from the Atmosphere.—The well-known process of extracting oxygen from the atmosphere by means of baryta has never been a commercial success, because after a while the baryta becomes inactive, owing probably to its absorption of carbonic acid from the air. At the "Inventions Exhibition," held during the summer months in London, the brothers Brin exhibited an improvement on the old process which promises to be very valuable. The air is freed from carbonic acid and water by caustic soda and then passed over barium oxide, heated to a temperature not above 600° C., in iron retorts. The temperature is regulated by a pyrometer, which controls also the supply of gas to the furnace. Under these conditions the oxygen of the air is absorbed by the baryta, barium peroxide being formed. The nitrogen which appears to be very pure is collected separately for use in the production of ammonia. On heating the peroxide of barium to full redness pure oxygen is given off. At this stage of the process powerful pumps are set in operation and make a partial vacuum in the retorts. The operations are continuous, and so long as the baryta is kept anhydrous and free from carbonic acid the same quantity will apparently last an indefinite time. The most interesting and perhaps the most useful part of the invention of the Brin Brothers is the production of ammonia by a very direct process. The nitrogen obtained as above and moistened by passing through water, is passed over a mixture of baryta, with charcoal heated to about 300° C. Carbonate of ammonia is thus obtained, the water being decomposed under the conditions named, its hydrogen combining with the nitrogen and its oxygen with the carbon. The ammonium compound is formed in considerable amount. (*Nature*, XXXII, 354.)

Solid Nitrogen: Lowest Known Temperatures.—K. Olszewski in a previous memoir describes apparatus for obtaining very low temperatures by means of oxygen and of air evaporating in a vacuum. In a subsequent series of experiments the author has further introduced into

his apparatus a second tube of very thin glass, and thus isolates the liquefied gases by a double gaseous stratum. The pressure and the temperature being greatly lowered he has been able to solidify nitrogen, carbon monoxide, formene, and nitrogen dioxide, and to determine at the same time the temperatures of solidification. Nitrogen solidifies at -214° under a pressure of 60 atmospheres; carbon monoxide at -207° under 100^{mm} pressure; formene at $-185^{\circ}\cdot 8$ under 80^{mm} pressure; and nitrogen dioxide at -167° under 138^{mm} pressure. The latter forms a colorless liquid. By reducing the pressure of solid nitrogen down to 4^{mm} of mercury he has succeeded in obtaining the lowest temperature known, -225° C. (-373° F.). *Comptes rendus*, c: 350 and 940.

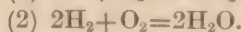
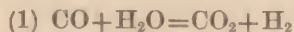
Separation of Liquefied Air into Two Distinct Liquids (by S. Wroblewski).—The laws of the liquefaction of air are not those of the liquefaction of a simple gas. If at first sight air presents itself in such a manner that it is permissible to speak of the critical point of air, this depends merely on the slight difference which exists between the curves of tension of watery vapor, of oxygen and of nitrogen. The author obtained air as two distinct liquids separated by a perfectly visible meniscus, as follows: After having liquefied at -142° a quantity of air in the tube of his apparatus, he allows such a quantity of gaseous air to enter the tube that the pressure of the gas is equal to 40 atmospheres and its optical density equal to that of the liquid. The meniscus of the liquid disappears entirely. He then slowly diminishes the pressure, and at the moment when the gauge shows a pressure of $37\cdot 6$ atmospheres a new meniscus appears at a point of the tube much higher than that occupied by the meniscus that has disappeared. A few moments afterward the old meniscus returns to the point where it disappeared, and at this moment two liquids are distinctly recognized and remain separate for some seconds. The lower liquid contains 21.28 vols. per cent. of oxygen, and the upper $17\cdot 3$ to $18\cdot 7$ per cent. (*Comptes rendus*, c1, No. 13.)

Solutions of Ozone and the Chemical Action of Liquid Oxygen.—At the Aberdeen meeting of the British Association for the Advancement of Science, Professor Dewar gave a description of the apparatus and method employed by him in the liquefaction of such gases as oxygen, &c., and after discussing the conditions required for the successful conversion into the liquid of the gases formerly called permanent, he gave an account of some experiments with liquid oxygen. At -130° liquid oxygen loses the active characters possessed by this element in the gaseous state; it is without action on phosphorus, sodium, potassium, solid sulphuretted hydrogen, and solid hydriodic acid. At very low temperatures other substances are similarly without action on each other; thus liquid ethylene and solid bromine may be brought in contact without any action taking place, whereas gaseous ethylene and liquid bromine unite directly at the ordinary temperatures.

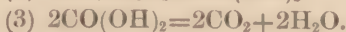
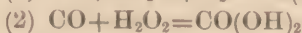
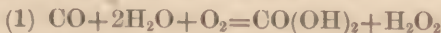
Hautefeuille and Chapuis, by subjecting a mixture of carbonic anhydride and ozone to great pressure, obtained a blue liquid, the color of which is due to ozone. If ozonized air be passed into carbon disulphide at -100° the liquid assumes a blue color, which disappears if the temperature be allowed to rise, and at a certain point a decomposition, resulting in the production of sulphur, takes place. The best solvent for ozone is a mixture of silicon tetrafluoride and Russian petroleum. These solutions of ozone are without action on metallic mercury and silver. (*Nature*, XXXII, 540.)

Combustion in Dried Gases (by H. Brereton Baker).—It will be remembered that, in 1880, Mr. H. B. Dixon demonstrated that carbon monoxide and oxygen, if perfectly pure and absolutely dry, do not unite when subjected to the electric spark, but that the introduction of a little moisture causes an explosion. Led by these experiments, Mr. Baker has investigated the question whether moisture is necessary for the combustion of carbon and of phosphorus in oxygen. The purified materials were sealed up in bent hard-glass tubes with oxygen and phosphoric anhydride. At intervals of one, two, four, up to sixteen weeks the contents of the tubes were heated and the character of the combustion compared with that of the same elements in moist oxygen. The results showed that the burning of carbon is much retarded by drying the oxygen to the extent possible with the arrangement adopted by the author. (*Chem. News*, LI, 150.)

On the Function of Water in the Combustion of Carbon Monoxide (by Moritz Traube).—As stated in the preceding section, Mr. Dixon proved that a mixture of perfectly dry carbon monoxide and oxygen is not exploded by the passage of electric sparks, and that the presence of a minute quantity of water suffices to determine the combination of the gases. Dixon supposed that the action of the water could be represented thus:

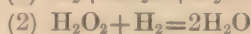
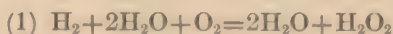


Moritz Traube confirms Dixon's experiments and goes further. He shows that a flame of carbon monoxide is extinguished when introduced into a perfectly dry atmosphere or into dry oxygen. On the other hand, he finds that carbon monoxide does not decompose water in complete absence of air or oxygen; and secondly, that when moist carbon monoxide and oxygen are exploded together, hydrogen peroxide is an invariable product. Consequently, Dixon's equations do not correctly represent the action, and Traube suggests the following:



When hydrogen is burned in moist oxygen, hydrogen peroxide always forms. Whether a perfectly dry mixture of hydrogen and oxygen

could or could not be exploded by electric sparks cannot be regarded as settled; the author thinks that such a mixture would prove to be non-explorable. He regards the mutual action of hydrogen, oxygen, and water as in all respects comparable with that of carbon monoxide, oxygen, and water, or with that of zinc, oxygen, and water. The changes which occur in the explosion of moist hydrogen and oxygen are thus formulated:



The second reaction has been experimentally demonstrated by the author. (*Ber. d. chem. Ges.*, XVIII, 1890.)

Indications of the Existence of an Allotropic Modification of Nitrogen and Synthesis of Ammonia.—Under this title George Stillingfleet Johnson has published a pamphlet of theoretical and practical interest. He reviews the experiments of Donkin, Berthelot, Déhérain, and Maquenne, P. and A. Thénard, and H. St. Clair Deville, showing the production of ammonia and of its salts by the action of the silent discharge, or of electric sparks upon mixtures of atmospheric nitrogen and oxygen, of watery vapor and nitrogen gas, and of hydrogen, nitrogen, and hydrochloric acid. Mr. Johnson then repeats some of his earlier experiments on the synthesis of ammonia, and after carefully eliminating sources of error obtains results which lead him to infer that the gas evolved from hot solutions of ammonium nitrite contains an allotropic or active form of nitrogen, which differs from ordinary nitrogen in possessing the property of forming ammonia by direct synthesis with hydrogen in presence of heated spongy platinum, and which is converted into ordinary inactive nitrogen by the action of heat, precisely as ozone is converted into ordinary oxygen by the same agency.

In experimenting with atmospheric nitrogen the author failed to obtain ammonia by passing the nitrogen, recently heated and mixed with hydrogen through red-hot tubes in the presence of platinum sponge. But he did obtain ammonia from atmospheric nitrogen which had *not* been heated.

One of the most important experiments is thus described: Into an ordinary endiometer tube full of mercury, pure nitrogen gas, obtained by any method, is introduced and measured. Next admit three times its volume of pure hydrogen gas and introduce into the gaseous mixture a fragment of wood charcoal previously ignited in hydrogen gas, or better, in a mixture of three volumes of hydrogen with one volume of nitrogen gas. Now pass the spark continuously through the wires of the endiometer. About 4 to 6 c. c. of the mixture are combined and absorbed by the charcoal per hour, until finally the whole of the gas may be made to disappear; after which, if the charcoal be removed, it will be found impregnated with ammonia. (*Chem. News*, LII, 34.)

Reduction of Carbon Dioxide to Carbon Monoxide by means of Charcoal (by Alexander Naumann and Carl Pistor).—Water-gas, formed by passing steam over incandescent charcoal, contains, besides hydrogen and carbon monoxide, varying quantities of carbon dioxide, which is a hindrance to the economic uses of the water-gas. In the following research the authors examined the chemical reactions which take place under varying temperatures, and with different quantities of charcoal. The temperatures were determined by inserting in the heated tube (combustion tubing 82 centimeters long) substances having well-established melting points, such as lead chloride (501°), silver pyrophosphate (585°), silver (954°), &c.

Experiments determine that the lowest temperature at which the reduction of carbon dioxide to monoxide by charcoal begins lies between 536° and 585° , say 550° , provided the gas be passed not too rapidly and the charcoal layer be 66 centimeters long.

With a charcoal layer only 10 centimeters long a much higher temperature is necessary, between 634° and 703° C. The amount of carbon dioxide reduced increases with the rise of temperature. For the table giving results of eleven experiments under varying conditions, we refer to the original article. (*Ber. d. chem. Ges.*, XVIII, 1647.)

Preparation of Cyanogen in the Wet Way (by G. Jacquemin).—The usual process, by the action of a concentrated solution of cupric sulphate on a saturated solution of potassium cyanide is incomplete, only half the cyanogen being evolved. In the process of the author all the cyanogen of the potassium cyanide is obtained and the gas is pure.

Two parts of cupric sulphate dissolved in four parts of water are placed in a retort or in a flask, on a water-bath, and, by means of a stoppered funnel, a concentrated solution of one part of pure potassium cyanide is gradually introduced. The reaction begins violently at ordinary temperatures and when the evolution slackens the temperature of the water-bath is elevated to quicken it. Ten grams of chemically pure KCN give 850 c. c. of pure cyanogen. Commercial KCN gives the same result, but the gas sometimes contains traces of CO_2 .

There are two processes for withdrawing the cyanogen of the copper cyanide. 1. Decant the liquid remaining in the retort or flask, wash by decantation, and add a slight excess of ferric chloride of 30° B., or higher. The action commences in the cold and a slight elevation of the temperature produces an abundant evolution of cyanogen. The ferric chloride passes to the state of ferrous chloride in transferring the copper cyanide to chloride, which sets free the cyanogen and forms cuprous chloride which turns to cupric chloride at the expense of the excess of persalt of iron. 2. Add to the washed copper cyanide some manganese peroxide and acetic acid. Heat slightly. Acetates of copper and manganese are formed and cyanogen is evolved. When the operation

is ended the evolution tube is replaced by a receiver, sulphuric acid is added, and the mixture of the two acetates is distilled to collect the acetic acid, which is used again. (C. E. M. from *Comptes rend.*, c, 1005.)

On Potassium Chromocyanide and Hydrochromocyanic Acid (by H. Moissan).—Potassium chromocyanide is obtained in several ways: By the action of potassium cyanide on chromous acetate; by calcining a mixture of potassium carbonate, dried blood, and finely-pulverized chromium; by the action of potassium cyanide on chromous chloride in an apparatus filled with carbon dioxide, and by the action of potassium cyanide on chromous carbonate.

Potassium chromocyanide forms fine crystals of a light yellow color, which occur several centimeters in length; it is very soluble in water, insoluble in alcohol at 94°, ether and chloroform. Its specific gravity equals 1.71. The salt is anhydrous. It is permanent in the air at ordinary temperatures. In solution it does not give as a rule precipitates with acid salts of the metals. With ferrous salts it yields a red precipitate; with zinc and lead salts, a white precipitate; with silver, bismuth, and barium salts, a yellow precipitate. Its physiological action is similar to that of ferrocyanide of potassium. It has the composition K_2CrCy_3 .

If dilute sulphuric acid be added to a concentrated solution of the salt, a white crystalline precipitate forms. This is the hydrochromocyanic acid, a very unstable body, decomposed in watery solution by acids. (*Ann. chim. phys.* [6], IV, 136.)

Notes on Nitrogen Trioxide and on Nitric Oxide.—Professor Ramsay, in a paper read before the chemical section of the British Association for the Advancement of Science, argued against the existence of gaseous nitrogen trioxide. He pointed out that the only criterion of the existence of this gas is the vapor density; NO_2 and NO mix without change in volume, and, therefore, no combination takes place. The vapor density of the first portion of the gas obtained by distilling liquid N_2O_3 , corresponds to that which a mixture of N_2O_4 , NO_2 , and NO should have.

At the same place Professor Dewar made remarks on the molecular weight of nitric oxide. A comparison of the curve of liquefaction of nitric oxide with that of methane shows the pressure to increase more rapidly with the temperature in the case of nitric oxide than in other gases, a fact that appears to indicate that at low temperatures the molecule of nitric oxide is of greater complexity and probably exists as N_2O_2 . (*Nature*, XXXII, 538 and 540.)

Reactions between Nitric Oxide and Oxygen under Varying Conditions (by G. Lunge).—The experiments described lead the author to the following conclusions: 1. In the dry state, nitric acid with an excess of oxygen combines to form N_2O_4 exclusively, or nearly so. 2. Dry nitric oxide and oxygen, with an excess of the former, yield a great deal of

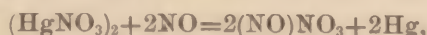
N_2O_3 along with N_2O_4 , both in a state of gas. 3. In the presence of water nitric oxide with an excess of oxygen is altogether converted into HNO_3 . 4. If nitric oxide and oxygen meet in the presence of concentrated sulphuric acid there is neither N_2O_4 nor HNO_3 formed, even with the greatest excess of oxygen, but the reaction is—



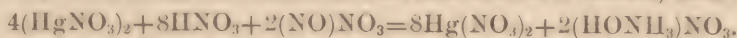
that is, nitrosyl sulphate and water.

This last reaction has an important bearing on the theory of the manufacture of sulphuric acid. The author maintains that it is not, as generally assumed, the nitric oxide, NO , but the nitrogen trioxide, N_2O_3 , which acts as the carrier of oxygen in the vitriol-chamber process. (*J. Chem. Soc., London, July, 1885, p. 465.*)

On the Reaction between Mercurous Nitrate and Nitric Oxide, and between Mercurous Nitrate and Nitrites (by Dr. Edward Divers and Tamemasa Haga).—It has been known for, perhaps, half a century that mercurous nitrate yields metallic mercury when treated with a solution of alkaline nitrite, and this reaction has always been regarded as one of oxidation of the nitrate by reduction of the mercury salt. The authors show this is incorrect. When, with exclusion of air, pure nitric oxide is passed into a solution of mercurous nitrate in dilute nitric acid, a precipitation of metallic mercury slowly takes place and hydroxyamine is formed in quantity, but no ammonia. Prolonged contact of the gas gives rise to beautiful long yellow prisms, while the hydroxyamine disappears from the mother liquor. This new yellow salt will be more fully described by the authors at a later date. The first stage of the reaction is thus formulated by these chemists:



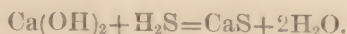
nitric oxide precipitating mercury from its salt. The nitrosyl nitrate, here assumed to form, will at once decompose with water and mercurous nitrate into hydroxyammonium nitrate and mercuric nitrate, thus:



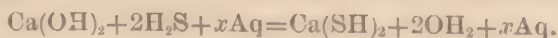
An after reaction between mercuric nitrate and the nitric oxide follows, and the hydroxyamine is decomposed. (*Chem. News, LII, 8.*)

The Sulphur Compounds of Calcium (by V. H. Veley).—The main points in this paper are thus summarized by the author:

1. By the action of hydrogen sulphide on solid calcium hydroxide there is formed a calcium monosulphide, in accordance with the equation:



2. By the action of hydrogen sulphide on calcium hydroxide in aqueous solution there is formed calcium hydrosulphide, in accordance with the equation:



3. Calcium hydroxy-hydrosulphide, CaSH, OH , absorbs carbon disulphide, with formation of unstable basic calcium thiocarbonates, decomposed slowly by hydrogen sulphide and readily by carbonic anhydride. (*J. Chem. Soc. Lond.*, July, 1885, p. 478.)

Decomposition of Didymium; Praseodymium and Neodymium.—Dr. C. A. von Welsbach read a paper before the Vienna Academy of Sciences on June 18, in which he describes an alleged decomposition of the elementary substance known as didymium. This decomposition was effected by means of the double ammonium or sodium nitrates in presence of lanthanum. In spite of the different behavior of the constituent bodies many hundred fractional crystallizations were necessary for their separation. The two new elements in solution are distinguished by intense absorption bands, and share between them the absorption bands of the peculiar spectrum hitherto ascribed to didymium. The colors of the compounds differ; the salts of that element which approaches nearest to lanthanum are of a leek green; the salts of the other element are rose or amethyst red. The latter body forms the bulk of didymium.

Both colors are almost complementary, but the amethyst red is by far the more intense, so that a small quantity of the salts of this element causes the green color of the others to disappear. The atomic weights of the two new elements are according to preliminary determinations very different, and vary considerably from the value heretofore ascribed to didymium. For the first element the author proposes the name praseodymium (Pr), and for the second neodymium (Ne). The two elements, so far as has been observed, yield each only one series of salts derived from the sesquioxide. Praseodymium peroxide evolves chlorine on treatment with hydrochloric acid. (*Chemiker Ztg.*, and *Chem. News*, LII, 49.)

Researches on the Complex Inorganic Acids [by Dr. Wolcott Gibbs].—Another and weighty instalment of his laborious researches was presented by Dr. Gibbs to the American Academy of Arts and Sciences early in June. Among other things, he shows that vanadic pentoxide unites with phosphoric or arsenic pentoxides in various proportions to form well-defined complex acids. Compounds of vanadic pentoxide, vanadic dioxide, and phosphoric or arsenic pentoxide may be formed possessing properties analogous to the corresponding compounds of tungsten and molybdenum. Compounds exist which contain pyrophosphoric and metaphosphoric acids in the place of orthophosphoric acid. Complex acids exist which contain two different modifications of phosphoric acid, as, for instance, metaphosphoric and orthophosphoric acids or oxides. The salts of a majority of these complex acids crystallize in well-defined forms. In a summary Dr. Gibbs catalogues the formula of not fewer than 72 new salts discovered and analyzed in the course of his prolonged investigations. (*Proceedings Am. Acad. Arts and Sciences*, XIX, 50.)

Sodium Orthovanadates and their Analogues (by Harry Baker).—Doubts expressed by Mendelejeff and by Rammelsberg as to the strict analogies between phosphorus, arsenic, and vanadium prompted the author to prepare and examine closely the sodium salts of tribasic orthovanadic acid. Trisodium phosphate and trisodium arsenate crystallize in hexagonal prisms with 12 molecules of water, and Roseoe describes the corresponding vanadate as acicular crystals with 16 molecules of water. The author finds, however, that a vanadate having 12 molecules of water ($\text{Na}_3\text{VO}_4 \cdot 12\text{H}_2\text{O}$), and crystallizing also in hexagonal prisms, can be obtained without difficulty.

Besides the latter, there exist two salts containing 10 molecules of water, one of which crystallizes in the isomeric and the other in the hexagonal systems. A third salt, crystallizing in rhombic tables, was obtained by the author, but owing to the great difficulties experienced in separating it from its mother liquid the water estimation was not satisfactory; it probably has the formula $\text{Na}_3\text{VO}_4 \cdot 8\text{H}_2\text{O}$. Phosphates and arsenates analogous to the three salts last named are not yet known. Sodium-vanadio-sodium-fluoride, $2\text{Na}_3\text{VO}_4 \cdot \text{NaF} \cdot 19\text{H}_2\text{O}$, is also described by the author and its contents in water accurately determined as given.

In conclusion, the author finds the analogies between vanadium, arsenic, and phosphorus strongly confirmed by the results of his investigation. (*Liebig's Annalen*, CCXXIX, 286.)

Recovery of Gold and Silver from Metallic Iron (by Dr. J. C. Booth).—In the course of an interesting article on the "Smelting Furnace of the U. S. Mint," the author gives his experience as to the best plan for recovering metallic gold and silver from the iron grate-bars, tools, &c. Formerly the iron was alternately heated and hammered until the precious metals scaled off. This operation took the labor of one dozen men during three or more days of ten hours each, for the gold clings with great tenacity to the iron; nor was the method without loss. At present all the iron residues from the furnaces, even including the grate bars, are melted, and while quietly melted the heavier gold and silver settle out of the iron. When the mass is cold the precious metal is knocked off the bottom by a hammer as a single tough ring, with scarcely a trace of iron in it, while the iron above has never yielded a trace of gold or silver to the assayer. (*Jour. Am. Chem. Soc.*, VII, 159.)

An Electrical Furnace for Reducing Refractory Ores (by E. A. and A. H. Cowles).—These gentlemen, together with Prof. C. F. Mabery, have devised an electrical furnace on the incandescent principle. A column of fragments of well-calcined charcoal is embedded horizontally in finely-pulverized charcoal and covered by a layer of the same material coarsely broken, the whole being arranged in a box of fire-brick covered with

perforated tile, and opened at the ends to admit two carbon electrodes an inch and a half in diameter. Through these is passed the current from a dynamo of 30 horse-power. By this arrangement such a temperature is obtained that not only platinum-iridium may be fused, but the most refractory oxides, such as alumina, silica, &c., are reduced to their elements with formation of carbon monoxide.

The apparatus is especially used in the manufacture of aluminum bronze and of silicium bronze for commercial purposes.

The application of electricity to smelting is not so novel as commonly supposed. In 1853-54, G. A. Pichon used an electric furnace in which ores of iron, mixed with one-hundredth of coke or charcoal, is fed between the poles of a series (two or more tiers) of large electrodes; fusion takes place and the metal and slag fall into a heated receiver below. (*Practical Mechanics' Journal*, VI, 257). In 1882, C. W. Siemens invented an electric furnace in which electrodes are arranged vertically one above another, the negative passing through the lid of the crucible into the metal to be melted, the other through the bottom of the crucible. The length of the arc is controlled automatically by the electro-motive force between the electrodes. This furnace was, however, for melting and not for smelting. (*Chem. News*, 1882, 163.)

The furnace of Messrs. Cowles and Mabery yields good results on a larger scale than those of others.

ORGANIC.

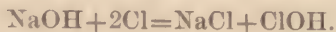
A Plea for the Empiric Naming of Organic Compounds (by Professor Odling).—Verbal translations of the structural formulae assigned to organic compounds possess certain advantages as names for the several compounds. Thus, they are applicable to all organic compounds of which the structural formulae are made out; they are the only sort of names applicable to complex isomeric compounds; and their use cannot be dispensed with wholly in the case of even less complex compounds. Notwithstanding these advantages structural names constitute unsuitable names for general use, more especially as applied to fundamental hydrocarbons, alcohols, and acids. They are objectionable for this use by reason of their length, complexity, and want of ready indicativeness, by the circumstance of their being based on conceptions of chemical constitution of a kind pointed out by experience as eminently liable to change, and by the further circumstance of their representing a one-sided, and so far an untruthful, notion of the bodies designated. Structural names expressing other than a distorted view of the constitution of all but a few of the most simple of organic bodies are impracticable by reason of their length and complexity. Hence, to avoid the distortion inseparable from the use of any single structural name for an organic body the only expedient is the assignment to each

body, in proportion to its complexity, of an indefinite number of structural names—a proceeding almost tantamount to not assigning it any particular name at all. Although from their number and complexity organic bodies can only be designated by names which do in some measure describe and characterize them, the primary purpose of a name is undoubtedly to designate and not to describe. Accordingly, with a view to the prompt mental association of object with name, brief empiric names based on the origin and properties of bodies are, wherever practicable, to be preferred to structural names. Isomeric bodies may, to a large extent, be distinguished by means of significant letters or syllables prefixed to the name common to the different isomers. But the suggested use of the particular letters α , β , γ , each in a special sense, also a general resort to the particles “hydro,” “oxi,” and “hydroxi,” as name components, and more especially the innovation of substituting the word “hydroxide” for the long established word “hydrate,” are practices open to grave objection. (Report of British Association for the Advancement of Science, in *Nature*, xxxii, 538.)

Ethyl-urethane, a new Hypnotic.—Carbamate of ethyl, or ethyl-urethane, $\text{CH}_2\text{C}_2\text{H}_5\text{NO}_2$, has been found to have the properties of a hypnotic. This compound is prepared by the action of aqueous ammonia on ethyl carbonate, or on ethylchloro-carbonate, and forms large transparent colorless crystals, which melt below 100°C ., and distill at 180° without alteration. It is soluble alcohol, ether, and water, to which it communicates a taste suggestive of saltpeter.

Experiments with ethyl carbamate were first made on animals by Schmiedelberg; recently von Jaksch has given the drug to man in doses of about 15 grains in over 100 cases. He finds it acts chiefly on the brain, having no appreciable influence over the peripheral nerves. It seems to be, therefore, a pure hypnotic. It causes a quiet and seemingly normal sleep, leaving no unpleasant secondary effects. (*Deutsche Medicinal-Ztg.*, September 14, 1885.)

Ethyl Compounds of Hypochlorous Acid (by Traugott Sandmeyer).—Ethyl hypochlorite, ClOC_2H_5 , is easily obtained as follows: Chlorine gas is passed into a solution of sodium hydroxide (1 part) in water (10 parts), cooled by ice, until absorption no longer takes place. This furnishes free hypochlorous acid and sodium chloride.



This is immediately placed in a separating funnel and mixed with one part of alcohol; the liquid becomes turbid and an oily layer separates. This oil is drawn off, washed, and dried in contact with calcium chloride. This ethyl hypochlorite forms a yellow, mobile, very volatile liquid of strong odor, and attacking the respiratory organs. It burns with a

greenish flame; it can be distilled at 36° C. (Bar=752 mm.) without decomposition, but if a few drops are overheated in a test-tube it explodes violently. The liquid is very sensitive to sunlight, boiling vigorously a few minutes after exposure, and exploding. This action is not accomplished by the heat rays. Even in diffuse light, ethyl hypochlorite can be preserved only a few hours, eventually decomposing without explosion.

It acts very energetically on ammonia, phenol, aniline, and other organic bodies. Mixed with bromhydric acid it sets bromine free, and alcohol forms. The body was analyzed indirectly by determining the amount of iodine a given weight set free, the iodine being estimated volumetrically by sodium hyposulphite.

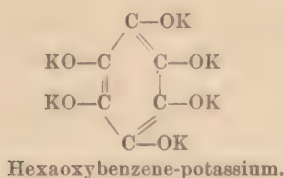
The author plans further researches on analogous bodies. (*Ber. d. d. chem. Ges.*, XVIII, 1767.)

On the Decomposition of the Terpenes by Heat (by William A. Tilden).—The author shows that experiments stated lead to the conclusion that the terpenes do not belong to the aromatic series, and are not formed on the benzene type. M. Berthelot, commenting on Tilden's paper, remarks he regards it of importance in confirming views which he (Berthelot) had announced fifteen years before. (*Ann. chim. phys.* [6], v, 120.)

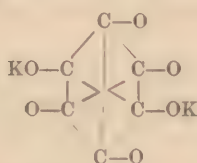
On Derivatives of Hexaoxybenzene and their Relation to Croconic and Rhodizonic Acid (by R. Nietzki and Th. Benckiser).—Starting with nitranilic acid, the authors have obtained a series of interesting bodies; a partial reduction of nitranilic acid yielded nitro-amido-tetraoxybenzene, and a more complete reduction gave diamido-tetraoxybenzene; the latter decomposes under certain conditions, forming a body having the formula $C_6H_{16}O_{14}$, which by reduction with tin and hydrochloric acid yielded the long-sought hexaoxybenzene $C_6(OH)_6$. This body proved to be identical with the trihydrocarboxylic acid obtained by Lerch from the action of potassium on carbon monoxide. On boiling the substance $C_6H_{16}O_{14}$, with water, it decomposed, with evolution of carbon dioxide, and yielded a solution which, neutralized with potash, gave on concentration orange yellow acicular crystals of potassium croconate $C_6K_2O_6$, first prepared in 1825 by Gmelin from the black residues of the manufacture of potassium according to the method of Wöhler and Brunner. From these facts it appears that Liebig, in his researches on the action of potassium on carbon monoxide, actually accomplished the direct synthesis of benzene derivatives from purely organic substances in the simplest manner.

This synthesis was successfully repeated by the authors, who obtained, besides potassium croconate, the rhodizonate long before discovered by Berzelius, Wöhler, and Heller. The latter salt was also obtained direct from dioxydichinoyl-sodium, thus establishing the identity

of rhodizonic acid, carboxylic acid, and dioxydichinoyl. When CO combines with K it forms $\text{O}=\text{C}-\text{OK}$, and six of these groups combine to form —



Partial oxidation of this substance yields—



Rhodizonate of potassium or potassium dioxydichinoyl.

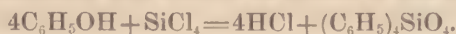
(*Ber. d. chem. Ges.*, XVIII, 499 and 1833.)

Organo-Silicium Compounds in the Aromatic Series (by A. Polis).—

Following the method devised by A. Michaelis in the preparation of the aromatic phosphines, arsines, and stibines, the author has made several silicium compounds in the aromatic series. Siliciumtetraphenyl, $\text{Si}(\text{C}_6\text{H}_5)_4$, is obtained by the action of one molecule of siliciumtetrachloride on four molecules of chlorbenzene in the presence of sodium and of absolute ether. The purified product forms a colorless crystalline powder, melting at 228° , little soluble in ether and in alcohol, easily soluble in chloroform and hot benzene. Heated with access of air, it burns, giving out flocks of silicic anhydride.

By similar processes the author obtained para-siliciumtetratolyl, $\text{Si}(\text{C}_6\text{H}_4\text{CH}_3)_4$, also melting at 228° ; siliciumtetrabenzyl, $\text{Si}(\text{CH}_2\text{C}_6\text{H}_5)_4$, which melts at 127.5° . Both of these bodies form colorless crystals having properties similar to siliciumtetraphenyl. (*Ber. d. d. chem. Ges.*, XVIII, 1540.)

Silicates of the Phenols (by J. Hertkorn).—Pure crystalline phenol (boiling at $182\text{--}183^\circ$) was gently melted and treated with chloride of silicium, the former being in excess; the temperature of the mixture was gradually raised to 220° to 225° ; hydrochloric-acid gas was evolved, and ceased after several hours. The simple liquid thus obtained was distilled, and the fraction, boiling at 420° , yielded, on cooling, long colorless prisms. The purified crystals, carefully dried, melted at 47° to 48° . Analysis showed the body to have the composition $(\text{C}_6\text{H}_5)_4\text{SiO}_2$, tetraphenyl silicate, and was formed as shown in the equation:

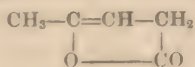


Tetraphenyl silicate dissolves easily in absolute alcohol, ether, benzene, toluene, xylene, chloroform, carbondisulphide, acetic acid, and formic acid without decomposition, but water precipitates a white gelatinous mass, and phenol dissolves out in the supernatant watery liquid. Since, however, the addition of an excess of alcohol or of ether causes the whole to go into solution, it is obvious that the precipitate consists of an acid phenyl silicate and not of silicic acid itself. With an excess of boiling water tetraphenyl silicate is completely decomposed into phenol and silicic acid.

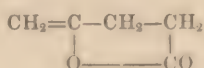
When tetraphenylsilicate is heated with absolute alcohol, phenol and tetrethyl silicate are formed for the most part, but the latter ester yields in the presence of traces of moisture diethylsilicate, and probably hexethylsilicate.

In a similar manner, the author prepared silicates of the three isomeric kresols; the *ortho* compound distilled at 435° – 438° ; the *meta* at 443° to 446° , and the *para* at 442° to 445° . The author likewise obtained *meta* and *ortho* tetraxylenyle silicate, $(C_{10}H_9)SiO_4$, as well as the silicates of six similar bodies of the aromatic series. (*Ber d. d. chem. Ges.*, XVIII, 1679.)

Some Derivatives of Lavulinic Acid (by Ludwig Wolff).—In distilling lavulinic acid a portion is decomposed and an oily substance obtained. This proves to contain two isomeric neutral bodies having the formula $C_5H_6O_2$, and behaving like lactones; one is α -angelicalactone, boiling at 167° , and the other, β -angelicalactone, boiling at 208° – 209° C. The former has the constitution—

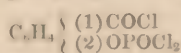


and the latter is probably—



(*Liebig's Annalen*, CCXXIX, 249.)

Action of Phosphorus Pentachloride on Salicylic Acid (by Richard Anschütz).—By the action of one equivalent of phosphorus pentachloride on one equivalent of dry salicylic acid the author obtained a colorless highly refracting liquid, boiling at 168° under 11^{mm} mercury, which gave on analysis the composition $C_7H_3Cl_4PO_4$. This orthochlorocarbonylphenyl-orthophosphoriedichloride has the constitution—



and proves to be identical with the "trichlorophosphate de salicyle," previously described by Couper. The specific gravity of this body is 1.554. Mixed with a small quantity of water this chloride dissolves with a rise of temperature, and from this solution pure salicylic acid crystallizes on cooling. Treated with a large quantity of water salicylic

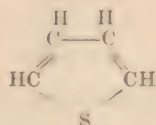
acid is not set free at once, but after several days ferric chloride gives a reaction. The author proposes to continue his researches. (*Liebig's Annalen*, CCXXVIII, 308.)

The Anilides of Orthophosphoric Acid (by A. Michaelis and H. von Soden).—By the action of oxychloride of phosphorus on aniline, orthophosphoric anilide, $\text{PO}(\text{NHC}_6\text{H}_5)_3$, is obtained in small crystals, soluble in boiling alcohol and melting at 208°C . On treating this with bromine it yields orthophosphorichexabromanilide, $\text{PO}(\text{NHC}_6\text{H}_3\text{Br}_2)_3$, also a crystallized body melting at 252° to 253°C .

Dianilidoorthophosphoric acid, $\text{PO} \cdot \text{OH}(\text{NHC}_6\text{H}_5)_2$, is obtained by treating the corresponding chloride with soda lye; it forms a white powder insoluble in cold water, and decomposed by hot water into aniline and phosphoric acid. This decomposition is more quickly effected by acids. The acid melts at 196° to 197° , becoming brown. Its silver salt forms a white precipitate, soluble in nitric acid and in ammonia. (*Liebig's Annalen*, CCXXIX, 334.)

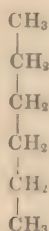
Chemical Constitution of Isatin (by H. Kolbe).—Isatin oxidized by chromic acid yields isatoic acid. This, heated with water, yields carbon dioxide and orthoamidobenzoic acid. With hydrochloric acid the chloride is formed. Sulphuric and nitric acids act similarly. Dissolved in alcohol and acted upon by hydrochloric-acid gas, ethyl orthoamidobenzoic hydrochloride is formed, which is decomposed by water. Isatoic acid with bases in the cold evolved carbon dioxide, so salts could not be formed. Ammonia solution gives ammonium carbonate and orthoamidobenzamide. Anilin acts similarly. Concentrated nitric acid gives nitroisatoic acid, which is more stable than nitric acid. This heated with hydrochloric acid or water gives a strong acid resembling metanitroorthoamidobenzoic. Reduction of the nitro-acid with tin and hydrochloric acid gives the hydrochloride of α -diamido-benzoic acid. Sulphuric acid gives the sulphate. Treatment of isatoic acid with nitrous acid gives α -nitrosalicylic acid. The author concludes that the formula $\text{C}_7\text{H}_4\text{NCO} \cdot \text{COH}$ gives the best explanation of the above facts. (F. P. V., from *Journal f. prakt. Chem.*, xxx, 467.)

The Constitution of Thiophene (by L. Gattermann, A. Kaiser, and Victor Meyer).—In 1883 Victor Meyer proposed the following constitutional formula for thiophene:

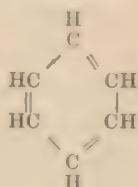


In the present article the authors refute some objections urged against this formula and present new reasons for maintaining it. (*Ber. d. chem. Ges.*, XVIII, 3005).

On the Synthetical Formation of Closed Carbon-chains. Part I—Derivatives of Trimethylene (by W. H. Perkins, jr.).—Organic chemistry is generally divided into two distinct sections, namely, the fatty series and the aromatic series. The members of the first series are derivatives of methane, the simplest hydrocarbon, and are characterized by their open or chain form, as, for example, in the case of normal hexane :



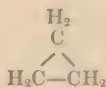
Aromatic compounds are, on the contrary, derivatives of a much more complicated basis, namely, of benzene, C_6H_6 , which, as was first shown by Kekulé in 1865, has the constitution :



that is, contains a ring consisting of 6 carbon-atoms joined in such a way as to form a regular hexagon.

These two series differ in the most marked way from one another, the members of the aromatic series being particularly characterized by their extreme stability.

In considering the differences between these two series, the author says it is a matter of surprise that no intermediate series should be known, the members of which should possess partly the character of fatty and partly that of aromatic compounds. It is quite reasonable to suppose that rings should exist having 3, 4, 5, 7 carbon-atoms as well as 6 carbon-atoms, though the few experiments made to test this supposition have up to this time failed to throw much light upon the subject. Victor Meyer has discussed the improbability of the existence of a 3-carbon-atom ring :



which would be isomeric with propylene, $\text{CH}_3.\text{CH}.\text{CH}_2$; but Reboul, by acting on trimethylene bromide with sodium, obtained a gas which he supposed to be ordinary propylene, and Freund has indicated certain reactions of this gas which the author (Perkins) shows are evidences of its being true trimethylene.

No attempts appear to have been made to synthesize the analogous 4-carbon ring :



though acenaphthene, a body in the aromatic series, without doubt contains such a ring. Fluorene is a hydrocarbon containing a 5-carbon ring, and several known bodies of the fatty series are closely allied to the hypothetical 4 and 5 carbon rings. These are furfuran, pyrrolidine, succinimide, and parabanic acid. The author adopts the following scheme of nomenclature for the 3, 4, 5, and 6 carbon rings:

Methylene.	Di-methylene (Ethylene).	Tri-methylene.	Tetra-methylene.	Penta-methylene.	Hexa-methylene.
$=CH_2$	$\begin{array}{c} CH_2 \\ || \\ CH_2 \end{array}$	$\begin{array}{c} H_2 \\ | \\ C \\ / \quad \backslash \\ H_2C-CH_2 \end{array}$	$\begin{array}{c} H_2C-CH_2 \\ | \quad | \\ H_2C-CH_2 \end{array}$	$\begin{array}{c} H_2 \\ | \\ C \\ / \quad \backslash \\ H_3C-CH_2 \\ | \quad | \\ H_2C-CH_2 \end{array}$	$\begin{array}{c} H_2 \\ | \\ C \\ / \quad \backslash \\ H_2C-CH_2 \\ | \quad | \\ H_2C-CH_2 \\ | \quad | \\ C \\ | \\ H_2 \end{array}$

He also proposes to distinguish the possible isomers by numbering the carbon-atoms in the ring as suggested by Baeyer (*Ber. d. chem. Ges.*, xvii, 960). The author describes fully the methods of preparation and the properties of a number of trimethylene derivatives, and promises at an early date to do the same for some tetramethylene derivatives.

The following table contains a list of the trimethylene bodies with their chief characters:

Formula.	Name.	Melting point.	Boiling point (720mm).
$\begin{array}{c} H_2 \\ | \\ C \\ / \quad \backslash \\ H_2C-CH_2 \end{array}$	Trimethylene	Gas .....	.....
$\begin{array}{c} CH.COOH \\ | \\ H_2C-CH_2 \end{array}$	Trimethylenecarboxylic acid ..	18-19°	182-184°
$\begin{array}{c} COOH.C.COOH \\ | \\ H_2C-CH_2 \end{array}$	Trimethylenedicarboxylic acid (1 : 1).	140-141°	.....
$\begin{array}{c} CH.COOH \\ | \\ H_2C-CH.COOH \end{array}$	Trimethylenedicarboxylic acid (1 : 2).	137°	.....

Formula.	Name.	Melting point.	Boiling point (720mm).
$\begin{array}{c} \text{COOH.C.COOH} \\ \text{H}_2\text{C} \diagup \text{CH.COOH} \end{array}$	Trimethylenetricarboxylic acid (1 : 1 : 2).	184°	.....
$\begin{array}{c} \text{CH.COOH} \\ \text{COOH.HC} \diagup \text{CH.COOH} \end{array}$	Trimethylenetricarboxylic acid (1 : 2 : 3).	145-150°	.....
$\begin{array}{c} \text{COOH.C.COOH} \\ \text{COOH.HC} \diagup \text{CH.COOH} \end{array}$	Trimethylenetetracarboxylic acid (1 : 1 : 2 : 3).	95-100°	.....
$\begin{array}{c} \text{CH}_3.\text{CO}.\text{CH} \diagup \text{CH}_2 \\ \text{CH}_2 \end{array}$	Acetyltrimethylene	Liquid ..	112-113°
$\begin{array}{c} \text{C}_6\text{H}_5.\text{CO}.\text{CH} \diagup \text{CH}_2 \\ \text{CH}_2 \end{array}$	Benzoyltrimethylene	Liquid ..	239-239.5°
$\begin{array}{c} \text{CH}_3.\text{CO}.\text{C.COOH} \\ \text{H}_2\text{C} \diagup \text{CH}_2 \end{array}$	Acetyltrimethylenecarboxylic acid.	Liquid ..	.....
$\begin{array}{c} \text{CH}_5.\text{CO}.\text{C.COOH} \\ \text{H}_2\text{C} \diagup \text{CH}_2 \end{array}$	Benzoyltrimethylenecarboxylic acid (1 : 1).	148-149°	.....
$\begin{array}{c} \text{CH}_3.\text{CO}.\text{C.COOH} \\ \text{H}_2\text{C} \diagup \text{CH.CH}_3 \end{array}$	Acetylmethyltrimethylenecarboxylic acid (1 : 2 : 1).	Liquid ..	.....
$\begin{array}{c} \text{C}_6\text{H}_5.\text{CNOH} \diagup \text{CH}_2 \\ \text{CH}_2 \end{array}$	Benzoyltrimethyleneoxime	86-87°	.....
$\begin{array}{c} \text{CH}_2\text{Br}.\text{CH}_2.\text{CH} \diagup \text{COOH} \\ \text{COOH} \end{array}$	γ-Bromomethylmalonic acid	116-117°	.....
$\text{C}_6\text{H}_5.\text{CO}.\text{CH}_2.\text{CH}_2.\text{CH}_2.\text{Br}.$	ω-Bromopropyl phenyl ketone.	37-39°	.....
$\begin{array}{c} \text{C}_6\text{H}_5.\text{CH}_2 \diagup \text{C} \diagdown \text{COOH} \\ \text{C}_6\text{H}_5.\text{CH}_2 \diagdown \text{C} \diagup \text{COOH} \end{array}$	Dibenzylmalonic acid	170-172°	.....

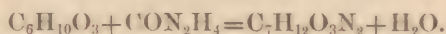
Ethereal salts of many of these bodies were also prepared and studied.

By heating hydroxylamine and hydrochloric acid with benzoyltrimethylene, in a sealed tube, a complicated reaction sets in, yielding a deep blue solution with an intense brick-red fluorescence. This solution proved to contain two distinct bases; that soluble in ether was found to have the constitution $\text{C}_{20}\text{H}_{15}\text{N}_2\text{O}_2$. It is easily soluble in acetone, aniline, and nitrobenzene, more sparingly in alcohol, ether, and in benzene. If the brownish-red alcoholic solution be treated with zinc dust and ammonia, it is reduced and becomes colorless; on agitating with air it is reoxidized. The salts of this base are easily obtained, and form deep-blue solutions with a most magnificent brick red fluorescence. The hy-

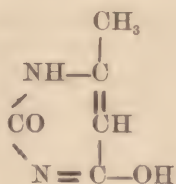
drochloride in a solid state outwardly resembles indigo in every respect, and its solution shows the same absorption spectrum as indigo. The internal constitution of this complicated molecule has not been ascertained.

The salts of trimethylenedicarboxylic acid (1 : 1) with ammonium, silver, copper, barium, and lead, form well-defined crystallized bodies. (*J. Chem. Soc. London*, 1885, 80.)

Syntheses of Derivatives of Urea (by Robert Behrend).—By the action of one molecule of acetic ether on one molecule of urea in alcoholic solution, the author obtained β -uramidocrotonic ether in accordance with the equation:



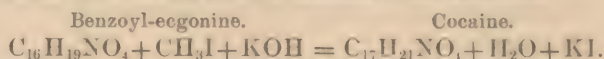
This body forms silky needles, melting at 165° to 166° C, insoluble in water, and crystallizing easily from alcohol. With alcoholic soda solution the salt $\text{C}_5\text{H}_7\text{N}_2\text{O}_3\text{Na}$ forms with separation of alcohol. This sodium salt, treated with acids (even carbonic acid is active), yields the body $\text{C}_5\text{H}_6\text{N}_2\text{O}_2$, for which the author proposes the name methyluracil, a name, however, not intended to indicate constitution. Methyluracil crystallizes from hot water in colorless needles; it is soluble in alcohol and insoluble in ether. It is decomposed on heating to 270° – 280° , becoming blackened and not melting. It dissolves easily in soda and potassa solutions, forming salts identical with those of uramidocrotonic ether. Theoretical considerations, which we cannot here detail, lead the author to adopt provisionally the following constitutional formula for methyluracil:



Bromine acts on methyluracil in the cold and yields brommethyluracil $\text{C}_5\text{H}_5\text{BrN}_2\text{O}_2$, a body crystallizing in microscopic prisms. Bromine converts this into a di-brom-compound. Strong nitric acid converts methyluracil into a nitro-compound, $\text{C}_5\text{H}_3\text{N}_3\text{O}_6$, which, by loss of carbonic acid, yields $\text{C}_4\text{H}_3\text{N}_3\text{O}_4$ nitro-uracil. The latter is reduced by tin and hydrochloric acid to, $\text{C}_4\text{H}_5\text{N}_3\text{O}_2$, amido-uracil; and this in turn by oxidation yields oxy-uracil, $\text{C}_4\text{H}_4\text{N}_2\text{O}_3$, an isomer of barbituric acid. Amido-uracil unites with cyanic acid, forming hydroxyxanthin, on which body the author continues his researches. (*Liebig's Annalen*, CXXIX, 1.)

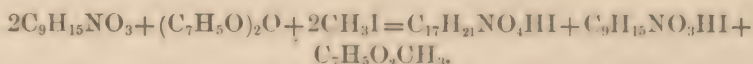
Synthesis of Cocaine, the New Anaesthetic (by W. Merck).—At the chemical manufactory of E. Merck, in Darmstadt, a quantity of a lye product was obtained in the extraction of cocaine, which was sent for examination to W. Merck, in Kiel. It formed a colorless, crystallizable body,

having a slight acid reaction, melting at 188.5° to 189° , and yielding by decomposition benzoic acid and ecgonine. Merck recognized it as benzoyl-ecgonin, or ecognine in which one hydrogen atom is replaced by benzoyl, $C_9H_{14}NO_3-C_7H_5O$. By heating this substance with potassium hydroxide and methyl iodide cocaine was obtained:



The artificial product was found to have all the properties of the natural.

Almost simultaneously with this result of Merck, the synthesis was accomplished by Sraup, who employed a mixture of benzoyl ecgonine, sodiummethylate, and methyl iodide. Sraup's method yielded, however, only about 4 per cent. of the theoretical amount, while Merck obtained 80 per cent. of the theoretical yield. Subsequently Merck succeeded in transforming ecgonine itself directly into cocaine by heating a mixture of methyl iodide, benzoic anhydride, and anhydrous ecgonine:



By introducing the radical ethyl a homologue of cocaine was obtained which the author calls cocäthylene. Merck is continuing his researches. (*Berichte d. chem. Ges.*, XVIII, 1594, 2264, and 2952.)

The Fat or Wax obtained from Cinchona—Researches on Bark.—O. Hesse obtains from the Cuprea barks cupreol, a compound which in all points resembles quebrachol. This body crystallizes from alcohol in colorless satiny leaflets, which quickly become dull in dry air. It is readily soluble in chloroform, ether, and hot alcohol; less readily in petroleum ether, and cold alcohol, and in water, ammonia, and potash-lye not at all. It melts at 140° , and at higher temperatures it volatilizes, unchanged in a current of hydrogen or carbonic acid. The solution in chloroform, when shaken with sulphuric acid of 1.76 spirit grains, turns a blood red, as do the the chloroform solutions of quebrachol, cholesterin, or phytosterin. Cinchol occurs in all true cinchona barks, but not in cuprea bark. From alcohol it crystallizes partly in long, almost acicular leaflets, partly in broad leaves, and always with 1 molecule of water. It loses a part of its water at 20° to 25° , and the rest at 100° , or in the desiccator. Anhydrous cinchol melts at 139° and in other respects has the properties of cupreol. The author describes the acetyl and propionyl derivations of cupreol. The china bark contains, therefore, three isomeric bodies, having the formula $C_{20}H_{33}O$, cupreol, cinchol, and quebrachol; all three belong to the cholesterins. (*Leibig's Annalen*, CCXXVIII, 288.)

Relation between Antiseptic Power and Chemical Constitution (by Dr. J. R. Duggan).—The author has made some suggestive experiments on

this relation to pave the way for further investigations. The following table is a list of the substances whose restraining influence has been determined with approximate accuracy, and of the amounts required in parts per 10,000 of the solution:

Oxybenzoic acids, C₆H₄(COOH)(OH).

	Parts in 10,000.
Salicylic acid (1 : 2)	4
Oxybenzoic acid (1 : 3)	6
Paraoxybenzoic acid (1 : 4)	8

Phenols, C₆H₅(OH)_x.

Phenol, C ₆ H ₅ (OH)	20
Pyrocatechin C ₆ H ₄ (OH) ₂ (1 : 2)	20
Resorcin C ₆ H ₄ (OH) ₂ (1 : 3)	25
Hydroquinone C ₆ H ₄ (OH) ₂ (1 : 4)	30
Pyrogallol C ₆ H ₃ (OH) ₃	15

Alcohols, RCH₂(OH).

Methyl alcohol CH ₃ (OH)	300
Ethyl alcohol C ₂ H ₅ (OH)	500
Propyl alcohol C ₃ H ₇ (OH) normal	200

The germicide power of formic, acetic, and propionic acids was also tested and found to be nearly in an inverse ratio to their acidity. For the peculiar order of the alcohols given in the above table the author can suggest no explanation. (*Am. Chem. Journ.*, VII, 62.)

Occurrence of Citric Acid in Seeds of Leguminous Plants (by H. Ritt-hausen).—The existence of citric acid, together with malic and oxalic acids, in the seed of the yellow lupine (*Lup. luteus*) has already been shown. The author finds it also in the seed of *Vicia sativa* (vetch), *V. faba* (hog's bean), various varieties of peas, and in the white garden bean (*Phaseolus*). The powdered seeds are digested with water acidified with hydrochloric acid, the solution filtered, neutralized with an alkaline hydrate, and precipitated with lead acetate. This is suspended in water, treated with sulphuretted hydrogen, and the citric acid gotten in the usual way from the acid liquid. The white bean contains very little citric acid, and peas contain less than the other legumes mentioned. (*Jour. f. prakt. Chem.*, XXIX, 357.)

Percentages of Alcohol in Ciders and of Acetic Acid in Vinegars (by W. French Smith).—This investigation was made to determine the maximum and minimum percentages of alcohol and acetic acid which genuine apple juice would produce. The expressed juice of selected apples was allowed to ferment slowly for two months in a cellar at an average temperature of 14° C. The determinations of alcohol were then made

by the ordinary method of distillation and specific gravity. Selected "August Sweets" gave 9.40 per cent. alcohol; the same variety of average quality gave 6.05 per cent.; and imperfectly ripe apples of same variety gave 4.80 per cent. "Greening" apples picked from the trees gave 4 per cent. alcohol. The average of eight experiments gave 5 per cent. *by weight*. Ten months later the acidity and solid residue in the samples was determined; the former varied between 10.1 per cent. and 4.40 per cent., and the latter between 2.70 per cent. and 3.64. The actual amounts of acetic acid found are lower than the alcoholic percentages in the original ciders demand, owing to imperfect acetification.

This investigation shows that a good cider should contain about 5 per cent. alcohol, and a fair sample ought not to fall below 4 per cent.; a good cider vinegar ought to contain from 5.5 of acetic acid to 7 per cent. (*Journ. Am. Chem. Soc.*, VII, No. 4.)

NOTES.

During the year 1884, 281,000 pounds of bromine were produced in the United States, 7,000,000 pounds of borax, and 1,800 troy ounces of aluminium. (ALBERT WILLIAMS, JR. *Report on Mineral Resources of the United States*.)

During the year 1883 there were manufactured in Germany 148,450 tons of hydrochloric acid and 115,500 tons of carbonate of soda; half of the latter was made by Solvay's process. During the same year there were manufactured in England 940,638 tons of sulphuric acid (calculated as H_2SO_4); 429,040 tons of soda ash (calculated as Na_2CO_3); and 141,868 tons of bleaching powder. Dr. Lunge thinks the Leblanc process and ammonia process for manufacturing soda will flourish side by side, and the latter will not displace the former unless hydrochloric acid can be made at the same time. (*Chemische Industrie*, VII, 78 and 213.)

Professor Mart. Websky has continued his researches on the supposed new element, idunium, contained in the lead vanadate of Cordoba (Argentine Republic), but has been unable to establish the identity of the metal as a new species. (*Sitzungsber. K. Akad., Wiss. Berlin*, February 5, 1885, page 95.)

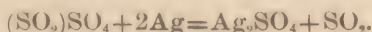
The rare metal gallium has been prepared by Dr. L. Ehrlich by an industrial process. From 80 kilos of zinc blende he obtained 0.9 grams gallium. The melting point of the metal is 30.5°C . The luster of gallium globules is greater than that of mercury. (*Chemiker-Zeitung*.)

Greville Williams finds that zinc dust occludes hydrogen. A given sample of commercial zinc dust contained 39 times its volume of hydrogen. The experimenter thinks the absorbed gas was originally derived from water and shows the bearing of this on the conclusions arrived at in the case of the Lenarto meteorite. (*Journal of Gas-Lighting*.)

The decomposition of potassium chlorate by heat has been studied anew by Dr. F. L. Teed. He finds that the equation commonly em-

ployed $[2\text{KClO}_3 = \text{KClO}_4 + \text{KCl} + \text{O}_2]$ does not truly represent the facts, and proposes the following: $10\text{KClO}_3 = 6\text{KClO}_4 + 4\text{KCl} + 3\text{O}_2$. The author confirms the statement that when MnO_2 is heated with the KClO_3 no perchlorate is formed. The phenomena noted appear to indicate that the molecular weight of the salt is much higher than is required by the formula KClO_3 . (*J. Chem. Soc. Lond.*)

New reasons for considering liquid or solid sulphur trioxide as S_2O_6 rather than SO_3 are afforded by the results of experiments reported by Dr. E. Divers and T. Shimidzu upon the reactions of pyrosulphuric acid with silver, mercury, and copper. When freed carefully from moisture, sulphur trioxide is without action on these metals, unless a little sulphuric acid be present. The reaction with silver is as follows:



(*Chem. News.*)

By heating in sealed tubes glucose with strong ammonia and subsequent treatment with solvents C. Tauret obtained two new alkaloids, which he calls, respectively, α -glucosine and β -glucosine. These form volatile colorless liquids, with a peculiar strong odor, the first boiling at 136° and the second at 160° . In acid solution they are precipitated by the usual reagents for alkaloids; with hydrochloric acid they form hydrochlorates. (*Bull. soc. chim.*, XLIV, 102.)

Professor Carnelley and James Schlerschmann have investigated the influence of strain on chemical action. Working with copper wires free and under strain, exposed to the action of ammonium chloride, they come to the conclusion that strain exerts no perceptible influence upon chemical action under the conditions described. (*Chem. News*, LII, 6.)

The causes of the decrepitations in samples of so-called explosive pyrites have been studied by B. Blount and formulated as follows: (1) The decrepitations are due to the presence of CO_2 , together with more or less H_2O . (2) The CO_2 is confined at high pressures probably sufficient to liquefy it. (3) The usual temperature at which the pyrites begin to decrepitate is 30° to 36° C. (*Chem. News*, LII, 7.)

The removal of micro-organisms from water forms the subject of a valuable paper by Dr. Percy F. Frankland, in the *Chemical News*, LII, 27, *et seq.*

Chlorochromic acid is prepared, according to H. Moissan, by bringing together gaseous hydrochloric acid and pure chromic anhydride perfectly free from sulphuric acid. On warming red fumes appear, which condense into chlorochromic acid; but a portion is decomposed by the water formed at the same time. Dry chlorine does not attack chromic anhydride. Gaseous hydrobromic and hydriodic acid do not form analogous chromium compounds. (*Bull. de l'Assoc. des Élèves de M. Frémy*, 2.)

Cocaine, the established anæsthetic, according to G. Calmels and E. Gossin, is "methylicbenzomethylethyltetrahydropyridine carbonate." (*Comptes rendus*, C, No. 17.) See Professor Odling's Plea for Empiric Names, in this report, under the head "Organic."

Researches on the influence of silicon upon the properties of cast iron, by Thomas Turner, show that, contrary to the generally accepted views on this subject, a suitable addition of silicon to cast iron improves the tensile-strength of the metal. An addition, however, of more than 2.5 per cent. causes deterioration. (*Chem. News*, LII, 5.)

Eleven months' experience with toughened glass beakers made under De La Bastie's patents leads R. J. Friswell to the conclusion that "toughened glass is a complete failure in the laboratory." (*Chem. News*, LII, 5.)

The adulteration of beer is discussed in a paper by Prof. H. B. Cornwall presented to the American Public Health Association. The average contents in alcohol of twelve beers was 4.197 per cent., and of extract, 6.26 per cent. Milwaukee beer contains as high as 5.35 per cent. of alcohol.

The apparatus and process for liquefying oxygen gas, employed by Cailletet, are figured and described in the *Journal de physique*, and in *Nature* (XXXII, 584), to which we refer for details.

Chlorine monoxide has been studied anew by K. Garzarolli Thurnlackh and G. Schacherl. It forms a dark brown liquid, having a yellowish-brown vapor; its density is 3.0072 at 10.6° C. and 726.4^{mm}, and its boiling point is 5° C. at 737.9^{mm}. Exposed to sunlight it does not decompose as commonly stated, and if organic material be excluded it does not explode in passing from the liquid to the gaseous state. (*Liebig's Annalen*, CCXXX, 273.)

By distilling plants in a fresh state with water, M. Maquenne has obtained small quantities of methylic alcohol, but he has not ascertained whether this body exists ready formed in the plants or is produced during the distillation. (*Comptes rendus*, CI, 1067.)

Vacciniin, a bitter principle occurring in the cowberry, discovered by Edó Claassen in 1870, has been found by the same chemist to be identical with arbutin, extracted from *Arbutus urea ursi*, Lin.—(*Am. J. Pharm.*, 1885.)

Under the title "The Sugar Chemistry of the United States" Prof. Harvey W. Wiley, chief chemist to the Department of Agriculture, has issued a valuable compend, in four parts, relating respectively to cane, beet, sorghum, and maple sugars. The analyses of maple sugar are numerous, and we learn that "there is no method of detecting the adulteration of maple sugar with other sucroses. The temptation to this adulteration is great because maple sugar commands nearly double the price of other sugars. Neither chemistry nor optics will help to a decision as to adulteration." A patented extract of hickory bark is used to give the characteristic flavor of maple sugar to glucose or cane sirups.

The second annual meeting of the Association of Official Agricultural Chemists was held September 1 and 2 at Washington, D. C. In the absence of Professor Johnson the chair was taken by the vice-

president, Prof. H. C. White. The "Proceedings," published by the Department of Agriculture as *Bulletin* No. 7, of the Division of Chemistry, will be found invaluable to all analytical chemists.

The chemical section of the American Association for the Advancement of Science met in August at Ann Arbor. The chairman of the section, Prof. William Ripley Nichols, addressed the members on "Chemistry in the Service of Public Health." The address will be found in the "Proceedings" of the association, vol. XXXIV.

The Institute of Chemistry (England) has undergone a transformation. Originally founded in October, 1877, with a membership of 150, it grew to embrace over 400 fellows. On the 30th of June, 1885, it ceased to have an official existence, but meanwhile, on the 13th of June, 1885, another organization was perfected under the title "Institute of Chemistry of Great Britain and Ireland," and the officers of the original society became officers of the new one. The new institute has secured a royal charter and has public duties and privileges accorded it, becoming a professional body officially known to Government. Dr. Odling, the president, gave his address November 6, 1885. (See *Chemical News*, LII, 243.) Dr. Odling's address is severely criticised by an anonymous writer in *Nature* (XXXIII, 73), who protests strongly against the commercial aspect of the views enunciated. He says: "The spirit [of the address] is an alien spirit, repugnant to students of pure science in this country."

A biography of the late Dr. Robert Angus Smith was read at the annual general meeting of the Manchester Literary and Philosophical Society held April 21, by Dr. E. Schunck. It will be found in *Chem. News*, LI, 293.

Prof. Edward Divers, of the Imperial College of Engineering, Tokio, met with a serious accident which threatened the loss of an eye. In attempting to remove the stopper of a bottle containing phosphorus trichloride he gently warmed the neck, when the bottle exploded violently, and projected glass into one eye. Dr. Divers supposes moisture had entered the bottle and formed hydrochloric acid, thus producing gas under tension.

On Monday, August 1, 1885, Prof. Michel Eugene Chevreul entered upon his one hundredth year. Apart from the fact that among men whose lives have been devoted to active scientific research no one has before attained so great an age, Chevreul stands conspicuous for the vast amount of work he has done, and for the great practical effect his work has had on the industries of the world. His researches on "les corps gras," begun in 1813, continued until 1823, when they appeared in a volume dedicated to Vauquelin, his teacher. His researches on color occupy the whole of volume XXXIII of the *Mémoires* of the Institut. It has often been remarked, it is difficult to realize that the Chevreul of "corps gras" fame and the Chevreul who wrote on colors are one and the same man. (Condensed from *Nature*, XXXII, 425.)

BIBLIOGRAPHY OF CHEMISTRY: 1885.

- Agenda du chimiste, à l'usage des ingénieurs, physiciens, chimistes, fabricants de produits chimiques, etc. Paris, 1885. 12mo.
- ALBRECHT, KARL.—Ueber einige Pyrogallussäure und Phloroglucinderivate und die Beziehungen derselben zu Daphnetin und Aesculetin. Berlin, 1884.
- ALLEN, A. H.—Commercial Organic Analysis. Second edition revised and enlarged. London, 1885. 8vo.
- AMATO, DOMENICO.—Del carbonio quale base del mondo organico. Prelezione. Catania, 1885.
- ANASTASI, AUG.—Nicolas Leblanc, sa vie et ses travaux, et l'histoire de la soude artificielle. Paris, 1884.
- ANGENOT, O.—Leçons sur le pétrole et ses dérivés. Anvers, 1885. 8vo.
- Annales de chimie. Tables de la 5ème série (1874-'83), dressées par Gayon. Paris, 1885. 8vo.
- ANTRICK, OTTO.—Ueber einige Verbindungen von Diacetonamin mit Aldehyden. (Erlangen). Würzburg, 1884.
- ARATA, PEDRO N.—Relacion de las trabajos practicados por la officina quimica municipal de la ciudad de Buenos Aires, 1884. Buenos Aires, 1885.
- ARNOLD, C.—Repetitorium der Chemie. Mit besonderer Berücksichtigung der für die Medizin wichtigen Verbindungen, sowie der Pharmacopoea germanica, namentlich zum Gebrauche für Mediziner und Pharmazeuten. Hamburg, 1885. 8vo.
- AUWERS, KARL.—Ein Beitrag zur Kenntniss des Pseudocumenols und des Pseudocumidins. Berlin, 1885.
- BÄNITZ, C.—Lehrbuch der Chemie und Mineralogie in populärer Darstellung. Theil II. Mineralogie. 3. Aufl. Berlin, 1885. 8vo.
- BARTLEY, ELIAS H.—A Text-book of Medical Chemistry for medical and pharmaceutical students and practitioners. New York, 1885. 12mo.
- BARTOLI, A. e E. STRACCIATI.—Le proprietà fisiche degli idrocarburi $C_n H_{2n+2}$ dei petroli. Roma, 1885. 4to.
- BAUER, A.—Beiträge zur Chemie der Ceritmetalle. Freiburg, 1884. 8vo.
- BAUER, R. W.—Ueber den aus Agar-Agar entstehenden Zucker; über eine neue Säure aus der Arabinose, nebst dem Versuch einer Classification der gallertbildenden Kohlenhydrate nach den aus ihnen entstehenden Zuckerarten. Jena, 1885. 8vo.
- BAUMANN, A.—Tafeln zur Gasometrie. Zum Gebrauche in chemischen und physikalischen Laboratorien, sowie an hygienischen Instituten. München, 1885. 8vo.
- BAUMHAUER, H.—Leitfaden der Chemie. Theil I. Anorganische Chemie. Freiburg, 1884. 8vo.
- BECK, PAUL.—Beitrag zur Kenntniss des Umbelliferons. (Erlangen). Berlin, 1884. 8vo.
- BEHREND, ROBERT.—Versuche zur Synthese von Körpern der Harnsäurereihe. Leipzig, 1885. 8vo.
- BEHRMANN, A. UND A. W. HOFMANN.—Umwandlung der Citronensäure in Pyridine-Verbindungen. Berlin, 1884. 8vo.
- BENOIT, E.—Du manganèse: étude de chimie analytique au point de vue de la pharmacie et de l'industrie, contenant un procédé de préparation du peroxyde de manganèse à l'état de pureté et une méthode nouvelle de dosage du manganèse à l'état métallique dans les minerais. Paris, 1885. 8vo.
- BERNARD, J.—Repetitorium der Chemie. Theil II. Chemie der Kohlenstoffverbindungen. (Organische Chemie.) Nach dem neuesten Standpunkte der Wissenschaft bearbeitet von J. Spennrath. Aachen, 1885. 8vo.
- BERNTSEN, A.—Studien in der Methylenblaugruppe. Heidelberg, 1885. 8vo.
- BEUTE, F.—Anleitung zur ersten Ausführung chemischer Arbeiten in landwirthschaftlichen Lehranstalten. Uelzen, 1885. 8vo.

- BECHELE, M.—Die chemischen Gleichungen der wichtigsten anorganischen und organischen Stoffe. Mit besonderer Berücksichtigung der deutschen und österreichischen Pharmacopöe, sowie der massanalytischen Untersuchungen der Arzneistoffe. Nach den neuesten chemischen Anschauungen bearbeitet. Eichstätt, 1885. 8vo.
- BLAS, C.—Analyse pyrognostique par la méthode de Bunsen, suivi de la détermination méthodique des minéraux, d'après la division dichotomique de Laurent et suivi d'un plan nouveau. Louvain, 1885. 12mo.
- BLAS, C.—Traité élémentaire de chimie analytique. Tome I. Analyse qualitative par la voie sèche, ou analyse au chalumeau. Louvain, 1885. 8vo.
- BOLTON, H. CARRINGTON.—A Catalogue of Chemical Periodicals. Annals New York Academy Sciences. London, 1885. 8vo.
- BOLTON, H. CARRINGTON.—The Students' Guide in Quantitative Analysis. Intended as an aid to the study of Fresenius' system. [Second edition.] New York, 1885. 8vo.
- BORNEMANN, E.—Ueber die Etard'sche Reaction zur Darstellung aromatischer Aldehyde, und einiger Abkömmlinge des Metatoluylaldehydes. Freiburg, 1884.
- BOUANT, E.—Aide mémoire de chimie. Paris, 1885. 12mo.
- BOUANT, E.—Cours de chimie. Paris, 1885.
- BOURGOIN, E.—Carbonyles, quinones, aldéhydes à fonction mixte. Paris, 1885. 8vo.
- BOWMAN, J. E.—Introduction to practical Chemistry; including Analysis. Edited by C. E. Bowman. Eighth edition. London, 1885. 12mo.
- BRANNT, W. T.—Practical Treatise on the Raw Materials and the Distillation and Rectification of Alcohol; also the preparation of alcoholic liquors, liqueurs, cordials, and bitters. Edited chiefly from the German of Stammer, Elsner, and Schubert. Philadelphia, 1885. 12mo.
- BRESLAUER, DR.—Chemische Untersuchung der Luft für hygienische Zwecke. Berlin, 1885. 8vo.
- BRIEGER, L.—Weitere Untersuchungen über Piomaïne. Berlin, 1885. 8vo.
- BRUNTON, T. LANTER.—A Text-book of Pharmacology, Therapeutics, and Materia Medica. Adapted to the United States Pharmacopoeia, by F. A. Williams. 8vo. Philadelphia, 1885.
- CAMPARI, G.—Studi sperimentali sulla distillazione secca dei legni resinosi per la produzione del catrame, della fabbricazione di olii di resina illuminanti, e sopra una nuova lampada per la combustione degli olii di resina molto carburati. Parma, 1884. 8vo.
- CARNELLEY, T.—Physico-chemical Constants. Melting and Boiling-Point Tables Vol. I. London, 1885. roy. 4to.
- CARPENTER, W. L.—Treatise on the Manufacture of Soap and Candles, Lubricants and Glycerin. London, 1885. 8vo.
- ČECH, KAREL.—Puvôd chmelařství a pivovarství. Praha, 1884.
- CHASTAING, M.—Chimie des alcaloïdes naturels. Paris, 1884. 8vo.
- Chemiker (Der) und Drogist.—Haupt-Organ für Chemiker, Drogisten, Gewerbetreibende, etc. Herausgegeben von H. Krätzer. Leipzig, 1885-'86. 4to.
- Chemisch-technische Mittheilungen der neuesten Zeit. Begründet von L. Elsner, fortgesetzt von W. Knapp. 3. Folge. Bd. VI. 1884-'85. Halle, 1885. 8vo.
- Chemisch-technisches Repertorium. Uebersichtlich geordnete Mittheilung der neuesten Erfindungen, Fortschritte und Verbesserungen auf dem Gebiete der technischen und industriellen Chemie mit Hinweis auf Maschinen, Apparate und Literatur. Herausgegeben von Emil Jacobsen. 1884. Berlin, 1885. 8vo.
- CHITTENDEN, R. H.—Studies from the Laboratory of Physiological Chemistry, Sheffield Scientific School of Yale College. For the year 1884-'85. New Haven, 1885. 8vo.
- CHRISTENSEN, O. T.—Ueber die Darstellung der den rothen und den gelben Blutlaugensalz analogen Chrom- und Manganverbindungen. 1885. 8vo.

- CIAMICIAN, G. e M. DENNSTEDT.—Studi sui composti della serie del pirrolo. Parte VIII. Sull' azione di alcuni anidridi di organiche sul pirrolo. Roma, 1885. 4to.
- CLASSEN, A.—Handbuch der analytischen Chemie. 3. verbesserte und vermehrte Auflage. Theil I. Qualitative Analyse. Stuttgart, 1885. 8vo.
- CLASSEN, A.—Quantitative chemische Analyse durch Elektrolyse. Nach eigenen Methoden. 2. gänzlich umgearbeitete und vermehrte Auflage. Berlin, 1885. 8vo.
- CLOWES, F.—Treatise on Practical Chemistry and Qualitative Inorganic Analysis. Fourth edition. London, 1885. 8vo.
- COLSON, A.—Recherches sur les substitutions dans les méthylbenzines. Paris, 1885. 4to. 55 pp.
- COOKE, J. P.—The New Chemistry. Eighth edition, remodeled and enlarged. London, 1884. 8vo.
- COUNCLER, C.—Bericht über die Verhandlungen der Commission zur Feststellung einer einheitlichen Methode der Gerbstoffbestimmung, geführt am 10. November 1883 zu Berlin. Redaction und Einleitung über die bisherigen Verfahren der quantitativen Bestimmung des Gerbstoffs. Nebst einer kritischen Originaluntersuchung über die Löwenthal'sche Methode von J. v. Schröder. Cassel, 1885. 8vo.
- CZYRNAŃSKI, EMIL.—Chemisch physische Theorie, aus der Anziehung und Rotation der Uratome abgeleitet. Krakau, 1885. 8vo.
- Δαβίδης, Ἰωαννῆς Κ.—Χημικὴ ἀνάλυσις τοῦ ἐν Ἰνδῶν τοιαύτοις ὕδατος. Ἐν Ἀθήναις, 1884.
- DAMMER, O.—Illustrirtes Lexikon der Verfälschungen und Verunreinigungen der Nahrungs- und Genussmittel, der Colonialwaaren, Drogen, gewerblichen Produkte, Dokumente, etc. Leipzig, 1885. 8vo.
- DEVENTER, C. M. VAN.—Schetsen uit de geschiedenis der scheikunde. Dordrecht, 1884. 8vo.
- DIXON, H. B.—Conditions of chemical change in Gases: Hydrogen, Carbonic Oxide, and Oxygen. London (Royal Society), 1885. 4to. 68 pp.
- Documents sur les falsifications des matieres alimentaires et sur les travaux du laboratoire municipal. Deuxième rapport. Paris, 1885.
- DUBREUIL.—La porcelaine. Paris, 1885.
- DURAND-CLAYE, C. L.—Chimie appliquée à l'art de l'ingénieur. Paris, 1885. 8vo.
- EBERT, H.—Zur Constitution des Succinylbernsteinsäureäthers. Leipzig, 1885. 8vo.
- EDER, J. M.—Ueber das Verhalten der Haloidverbindungen des Silbers gegen das Sonnenspectrum und die Steigerung der Empfindlichkeit derselben gegen einzelne Theile des Spectrums durch Farbstoffe und andere Substanzen. Wien, 1885. 8vo.
- EGGER, E.—Zweite Rechenschaftsbericht des chemischen Untersuchungsamts für die Provinz Rheinhessen, nebst Beiträge zur einer Hydrologie für die Provinz Rheinhessen. Mainz, 1885. 8vo.
- ELBERS, A.—Ueber einige Verbindungen von Hydrazinen mit Keton- und Aldehydsäuren. Erlangen, 1884. 8vo.
- ELSINGHORST, G.—Ueber halogensubstituirte Hydrazine. Erlangen, 1884. 8vo.
- ELSNER, F.—Die Praxis des Nahrungsmittel-Chemikers. 3. Auflage. Hamburg, 1885. 8vo.
- Encyclopédie chimique publié sous la direction de Frémy. Paris, 1885. 8vo.
- Tome II. Métalloïdes. Section 3. Bore, Silicium, Silicates, par Joly et Curie.
- Tome II. Métalloïdes. Complément. Partie I. Charbon de bois: noir de fumée; combustibles minéraux, par Urbain et St. Meunier.
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- Vol. III. Métaux. Cahier 6. Zinc, Cadmium, Thallium, par P. Sabatier.
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- Vol. V. Applications de chimie inorganique, la porcelaine, par Dubreuil.

Encyclopédie chimique publié sous la direction de Frémy—Continued.

Vol. V. Applications de chimie inorganique, Partie 2. Métallurgie. Cahier 7. Métallurgie de l'argent, par C. Roswag.

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Vol. X. Applications de chimie organique. Chimie agricole. Nutrition de la plante, par Dehéraïn.

Vol. X. Applications de chimie organique. Contribution à l'étude de la chimie agricole, par Th. Schloesing.

ENGEL, WALTERED.—Ueber die Amidoverbindungen methylirter Benzole und über ein neues Cumidin. Berlin, 1885.

ERDMANN, H.—Ueber die Umwandlung der Lactonsäuren in Lactone durch Schwefelsäure und über eine neue Reaction des Isocapro lactons; ein Beitrag zur Geschichte der Lactone. Halle, 1885. 8vo.

ERLENMEYER, E.—Lehrbuch der organischen Chemie. Band II. Lief. 1. Redigirt von O. Hecht. Leipzig, 1885. 8vo.

EXNER, F.—Ueber eine neue Methode zur Bestimmung der Grösse der Moleküle. Wien, 1885. 8vo.

FEICHTINGER, G.—Chemische Technologie der Mörtelmaterialien. Braunschweig, 1885. 8vo.

FISCHER, B.—Lehrbuch der Chemie für Pharmaceuten. Mit besonderer Berücksichtigung der Vorbereitung zum Gehülfen-Examen. 1. Hälfte. Mit 20 in den Text gedruckten Holzschnitten. Stuttgart, 1885. 8vo.

FISCHER, O.—Ueber Flavanilin. [München.] 1885. 8vo.

FOELSING, A.—Ueber einige Aetherester der Glycolsäure und Salicylsäure. I. Einwirkung von Bromwasserstoffsäure. II. Einwirkung von Ammoniak. Freiburg, 1884. 8vo.

FONVIELLE, W. DE.—Le Monde des atomes. Paris, 1885. 16mo.

FONTAINE, H.—Electrolysis, a practical treatise on nickeling, coppering, gilding, silvering, the refining of metals and treatment of ores by electricity. Translated from the French by J. A. Berly. New York, 1885. 8vo.

Fortschritte (Die) der Chemie. No. 6. 1884-'85. Herausgegeben von H. J. Klein. Köln, 1885. 8vo.

FRÄNKEL, NAHEMI NORBERT.—Zur Kenntniss des Thiodiphenylamins. Zürich, 1885.

FRANKLAND, E. AND F. R. JAPP.—Inorganic Chemistry. London, 1885. 8vo.

FRESE, C.—Beziehungen zwischen den physikalischen Eigenschaften, und der Zusammensetzung chemischer Verbindungen. Brieg, 1884. 4to.

FREMERY, M.—Ueber Arsenwolframsäure und ihre Salze. Freiburg, 1884. 8vo.

FREMY, ET A. TERREIL.—Le guide du chimiste. Répertoire de documents théoriques et pratiques à l'usage des laboratoires de chimie pure et de chimie industrielle. Paris, 1885. 8vo.

FRESENIUS, C. R.—Anleitung zur qualitativen chemischen Analyse. 15. verbesserte Auflage. Abtheil 1. Braunschweig, 1885. 8vo.

FRESENIUS, R.—Traité d'analyse chimique qualitative; des manipulations et opérations chimiques, des réactifs et de leur action sur les corps les plus répandus, etc. 7. édit. française traduit (sur la 14ème allemande) par L. Gautier. Paris, 1885. 8vo.

FRESENIUS, R.—Quantitative Analysis. Translated by Ch. E. Groves. Vol. II, part 1. London, 1885. 8vo.

FRESENIUS, R.—Tratado de análisis química cualitativa. Vert. y adición p. V. Peset. Valencia, 1884. 4to.

- FROEHLICH, EMANUEL.—Ueber die Benzoylirung aromatischer Phthalimide, insbesondere des Phthalpseudocumids. Berlin, 1885. 8vo.
- FRÜHLING, R., and J. SCHULZ.—Anleitung zur Untersuchung der für die Zucker-Industrie in Betracht kommenden Rohmaterialien, Producte, Nebenproducte und Hülfssubstanzen. Zum Gebrauche zunächst für die Laboratorien der Zuckerfabriken, für Chemiker, Fabrikanten, Landwirthle und Steuerbeamte, sowie für landwirthschaftliche und Gewerbeschulen. Mit in den Text eingedruckten Holzstichen. 3. vermehrte und verbesserte Auflage. Braunschweig, 1885. 8vo.
- FRUTIGER, G.—Cours élémentaire de chimie inorganique d'après les théories modernes. Genève, 1885. 8vo.
- FUES, ERNST.—Ueber einige neue Abkömmlinge des Benzidins und Diphenols. Berlin, 1885.
- GATTELMANN, LUDWIG.—Ueber einige Derivate des *m* Nitro-*p*-toluidins. Göttingen, 1885.
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- GEYMET.—Traité pratique de photographie. Éléments complets, perfectionnements et méthodes nouvelles. Procédé au gélatinobromure. 3. édition revue et augmentée. Paris, 1885. 8vo.
- GILKINET, A.—Traité de chimie pharmaceutique. Liège, 1885. 8vo.
- GIRARD, J. DE.—Phosphines dérivées des aldéhydes. Paris, 1884. 4to.
- GORUP-BESANEZ.—Lehrbuch der Chemie. Band I. Anorganische Chemie. 7. Auflage neu bearbeitet von A. Rau. Braunschweig, 1885. 8vo.
- GRAETZEL, R.—Zur Kenntniss des Dibromcymols. Nachweis der Stellung der Bromatome. Freiburg, 1884. 8vo.
- GRAHAM, OTTO.—Ausführliches Lehrbuch der Chemie. 3. gänzl. umgearbeitete Auflage. Band I. Physikalische und theoretische Chemie. Abtheilung 1. Physikalische Lehren von A. Winkelmann. Braunschweig, 1885. 8vo.
- GUARESCHI, J.—Enciclopedia di chimica scientifica e industriale colle applicazioni all' agricoltura ed industrie agronomiche, alla metallurgia, alla mercologia, ecc. Torino, 1885.
- GUÉZEN, A.—Mémoire sur la théorie chimique de la production du gas d'éclairage. Mémoire II. Paris, 1885. 8vo.
- HAGER, H.—Chemische Reactionen zum Nachweise des Terpentinsöls in den ätherischen Oelen, in Balsamen, etc. Für Chemiker, Apotheker, Drogisten und Fabrikanten ätherischer Oele. Berlin, 1885. 8vo.
- HAGER, HERMANN.—Ueber die Einwirkung von Chlorameisensäureäther auf Paranitranilin. Göttingen, 1884.
- HAGER'S Untersuchungen. Ein Handbuch der Untersuchungen, Prüfung und Wertbestimmung aller Handelswaren, Gifte, Lebensmittel, Geheimmittel, etc. 2. umgearbeitete Auflage herausgegeben von H. Hager und E. Holdermann. Leipzig, 1885. 8vo.
- HANDS, T.—Numerical Exercises in Chemistry: Inorganic. 650 examples. London, 1885. 8vo.
- HANDS, T.—The same, "with answers."
- Handwörterbuch der Chemie. Herausgegeben von H. von Fehling und C. Hell. Liefg. 48, 49, und 50. Braunschweig, 1885. 8vo.
- HÄNLE, O.—Ueber die Einwirkung von Jod auf die Silbersalze der rechts- und links-polarisirenden Weinsäuren. Freiburg, 1884. 8vo.
- HAPP, J. B.—Ueber Chinolin-para-sulfonsäure und ihre Derivate. Freiberg, 1885. 8vo.
- HARACOURT, C.—Notions de chimie. 4me édit. Paris, 1885. 8vo.

- HAUSHOFER, K.—Microscopische Reactionen. Eine Anleitung zur Erkennung verschiedener Elemente und Verbindungen unter dem Microscop; als Supplement zu den Methoden der qualitativen Analyse. Braunschweig, 1885. 8vo.
- HAUSHOFER, K.—Beiträge zur mikroskopisch-chemischen Analyse. (Nachweis des Wolframs; über die mikroskopischen Krystallformen einiger Oxalate; über einen kleinen Filtrirapparat.) [München], 1885. 8vo.
- HEFELMANN, RUDOLF.—I. Ueber die Entschwefelung einiger Thioharnstoffe mittelst Quecksilbercyanid. II. Beitrag zur Kenntniss des Sulfobenzids. Berlin, 1885.
- HEINTZE, O.—Krystallographische Untersuchungen einiger organischen Verbindungen. Rawitsch, 1885. 8vo.
- HESS, WILHELM.—Ueber das β -Lacton der Isopropylnitrophenylmilchsäure. München, 1884. 8vo.
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- HOFMANN, A. W.—Zur Erinnerung an Jean Baptiste André Dumas. [With Dumas' portrait.] Berlin, 1885. 8vo.
- HOFMANN, A. W.—Beiträge zur Kenntniss der Coniin-Gruppe. 2 Theile. Berlin, 1885.
- HOLLSTEIN, R.—Kurze Geschichte der Lehre von Isomorphismus und Polymorphismus. Lüdenscheid, 1885. 4to.
- HORBACZEWSKI, J.—Ueber künstliche Harnsäure und Methylharnsäure. Wien, 1885. 8vo.
- HORSTMANN, A.—Theoretische Chemie einschliesslich der Thermochemie. Braunschweig, 1885. 8vo.
- HOWITZ, H.—Beiträge zur Kenntniss der Alkylaniline, sowie über die Einwirkung von Natrium und Natrium-Propylbromid auf para-Bromdimethylanilin in ätherischer Lösung. Freiburg, 1884. 8vo.
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- Jahresbericht über die Leistungen der chemischen Technologie mit besonderer Berücksichtigung der Gewerbestatistik für das Jahr 1884. Jahrgang I-XXV bearbeitet von R. v. Wagner. Fortgesetzt von F. Fischer. XXX, oder Neue Folge XV. Jahrgang. Leipzig, 1885. 8vo.
- Jahresbericht über die Fortschritte der Pharmakotherapie. Herausgegeben von E. R. Kobert. Band I, für das Jahr 1884. Strassburg, 1885. 8vo.
- Jahresbericht über die Fortschritte der Chemie und verwandter Theile anderer Wissenschaften. Herausgegeben von F. Fittica. Für 1883 Heft IV (Schluss). Giessen, 1885. 8vo.
- JOHN, O.—Ueber die blausäuren Salze organischer Basen. Freiburg, 1884. 8vo.
- JOLY et CURIE.—La chimie du bore, du silicium et des silicates. Paris, 1885. 8vo.
- JUNG, OTTO.—Beitrag zur Kenntniss des Daphnetins. Berlin, 1885.
- JUNGLEISCH, E.—Manipulations de chimie. Guide pour les travaux pratiques de chimie. Paris, 1885. 8vo.
- JÜTNER VON JONSTORFF, H.—Praktisches Handbuch für Eisenhütten-Chemiker. Wien, 1885. 8vo.

- KAHN, MYRTIL.—Ueber die Einwirkung von Normalbutylaldehyd auf Anilin bei Gegenwart von rauchender Salzsäure. München, 1885. 8vo.
- KAISER, ADOLF.—Ueber Mononitroderivate der *p*- und *m*-Acetamidobenzoësäure, sowie deren Reductionsproducte (Anhydrosäuren). Alfeld, 1885.
- KAUDER, E.—Producte der Einwirkung von Fünffach-Chlorphosphor auf Succinylverbindungen und Weinsäure. Leipzig, 1885. 8vo.
- KAYSER, R.—Chemisches Hilfsbuch für die Metall-Gewerbe. Würzburg, 1885. 8vo.
- KEKULÉ, A. et O. WALLACH.—Tableaux servant à l'analyse chimique. Traduit par J. Krutwig. 2ème édition. Bonn, 1885. 8vo.
- KELLER, PAUL.—Ueber einige Derivate des Kyanmethins. Leipzig, 1885.
- KENT, W. H.—Untersuchungen über Milchzucker und Galactose. Göttingen, 1885. 8vo.
- KIRSCH, E.—Beiträge zur Kenntniss des Dibromcymols (Stellung der Bromatome). Freiburg, 1884. 8vo.
- KLEEMAN, S.—Ueber zwei Synthesen der Methyläthylalphaamidoessigsäure. Erlangen, 1884. 8vo.
- KLEIN, J.—Ueber das Tetraphenyläthan und über die Einwirkung des Chloraluminums auf phenylhaltige Derivate chlorirte und bromirte Aethane. Freiburg, 1884. 8vo.
- KLOTZ, CARL.—Ueber Dichlortoluole und Dichlorbenzoësäuren. Stüttgart, 1885.
- KLUBUKOW, NIKOLAUS VON.—Ueber zwei neue Verfahren zur Bestimmung der Dampfdichte. Leipzig, 1885.
- KNOBE, LUDWIG.—Ueber die Bildung von Kohlenstoff-Stickstoff-Ringen durch die Einwirkung von Amin- und Hydrazinbasen auf Acetessigester und seine Derivate. Erlangen, 1885.
- KNYRIL, MAX.—Beiträge zur Kenntniss der α -Naphtol- β -monosulfosäure. Freiburg i. B., 1885.
- KORSCHÉLT, O., and H. YOSHIDA.—The chemistry of Japanese lacquer. [London?], 1885.
- KREYSLER, ED.—Ueber einige Phenoleder der Phosphorsäure. Reactionsverhältnisse der neutralen Phosphorsäureester einiger Phenole. Zürich, 1885.
- KRÜGER, PAUL.—Ein Beitrag zur Kenntniss der Abkömmlinge des Hydroxylamins. Berlin, 1885.
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- KUBIERSCHKY, KONRAD.—Ueber die Thiophosphorsäuren. Rostock, 1884.
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- KULISCH, PAUL.—Ueber die Einwirkung des Phosphorwasserstoffs auf Metallsalzlösungen. Berlin, 1885.
- LAMPERT, FRIEDR.—Ueber einige Derivate des Trichlor-*p*. amidophenols. Rostock, 1885.
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- LANGER, C., und V. MEYER.—Pyrochemische Untersuchungen. Braunschweig, 1885. 8vo.
- LEBLANC, R.—Manipulations de chimie. Leçons pratiques. 4. édit. Paris, 1885. 12mo.
- LEEDS, ALBERT R.—The Literature of Ozone and Peroxide of Hydrogen. Memoir II, including: 1. Historical-critical Résumé of the Progress of Discovery since 1779. 2. Index to the Literature of Ozone (1779-83). 3. Index to the Literature of Peroxide of Hydrogen (1879-83). [New York], 1884. 8vo.
- LESCHHORN, JACOB.—Ueber Phenylglycerinsäure und einige Derivate derselben. Würzburg, 1884. 8vo.
- LEVIN, L.—Lehrbuch der Toxicologie. Berlin, 1885. 8vo.
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- LIVEING, G. D.—Chemical Equilibrium the Result of Dissipation of Energy. London and Cambridge, 1885. 8vo.
- LOUISE, E.—Synthèse d'hydrocarbures, d'acétones, d'acides d'alcool, d'éthers, de quinones dans la série aromatique. Paris, 1884. 4to.
- LÖW, WILHELM.—Ueber Terephthaldehyd. (Erlangen.) München, 1885. 8vo.
- LUBARSCH, O.—Die chemische Prüfung des komprimierten Pyroxylyns. Ein Beitrag zur Analyse der Sprengkörper. Berlin, 1885. 4to.
- LUCKENBACH, G.—Beitrag zur Kenntniss der Imidoäther und Amidine. Freiburg, 1884. 8vo.
- LUDWIG, E.—Medicinische Chemie. Wien, 1885. 8vo.
- LUHMANN, E.—Die Kohlensäure. Eine ausführliche Darstellung der Eigenschaften des Vorkommens, der Herstellung und technischen Verwendung dieser Substanz. Wien, 1885. 8vo. [Chemisch-technische Bibliothek, Band 124.]
- LUNGE, G.—Traité de la distillation du goudron de l'houille et du traitement de l'eau ammoniacale. Traduit par L. Gautier. Paris, 1885. 8vo.
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- MEHNER, H.—Die Fabrikation chemischer Düngemittel in Leipzig. Leipzig, 1885. 8vo.
- METZGER, S.—Pyridin, Chinolin und deren Derivate. Gekrönte Preisschrift der philosophischen Fakultät der Universität Würzburg. Braunschweig, 1885. 8vo.
- MEYER, E. VON.—Zur Frage nach der chemischen Constitution des Anthrachinons. Leipzig, 1884. 8vo.
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- MONSELESE, M.—L'ambra primaticcia o sorgo zuccherino del Minnesota. Seconda edizione. Mantova, 1884.
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- OSTWALD, W.—In Sachen der modernen Chemie. Offener Brief an Herrn Albrecht Rau. Riga, 1844.
- PALM, R.—Grundriss der qualitativen und quantitativen chemischen Analyse nebst einer General-Tabelle der wichtigsten Pflanzen-Alkaloide und einer Spectraltafel. Leipzig, 1885. 8vo.
- PAWLOW, O.—Ueber Tetrinsäure und deren Homologe. [St. Petersburg], 1884. 8vo.
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- RAMMELSBERG, C. F.—Leitfaden für die qualitative chemische Analyse. 7. Aufl. Berlin, 1885. 8vo.
- Recueil des travaux chimiques des Pays-Bas. Par W. A. van Dorp, A. P. N. Franchimont, S. Hoogewerff, E. Mulder et A. C. Oudemans, jr. Tome III. Leide, 1885. 8vo.
- REDDIE, C.—Ueber das Verhalten des Anhydroacetometaparatoluyldiamins gegen Brom und gegen Salpetersäure. Göttingen, 1885. 8vo.
- RICHARZ, F.—Die Bildung von Ozon, Wasserstoffsperoxyd und Ueberschwefelsäure bei der Electrolyse verdünnter Schwefelsäure. Berlin, 1884. 8vo.
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- RICHTER, V. VON.—Chemie der Kohlenstoffverbindungen, oder organische Chemie. 4. Aufl. Bonn, 1885.
- RICHTER, V. VON.—Trattato di chimica inorganica. Tradotto e corredato di note e di un appendice dal' A. Piccini. Torino, 1885. 8vo.
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- RIVIÈRE, A. et C.—Traité de manipulations de chimie. Paris, 1885. 2 vols. 12mo.
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- Skandinaviens kemisk-tekniske Centralblad for Danmark, Sverige, Norge og Finland. Kjøbenhavn. Aarg. IV, 1885. 8vo.
- SCHAEGLER, C.—Die Technologie der Fette und Öle der Fossilien (Mineralöle), sowie der Harzöle und Schmiermittel. Leipzig, 1885. 8vo.
- SCHAEGLER, C.—Kurzer Abriss der Chemie der Kohlenwasserstoffe. Zugleich ein Repetitorium für Studierende und practische Chemiker, Techniker, Apotheker u. s. w. Leipzig, 1885. 8vo.
- SCHAEFER, TH.—Ueber die Bedeutung der Alchemie. Bremen, 1885. 4to.
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- SCHILLING, E.—Ueber Caffeinmethyllhydroxyd, ein Beitrag zur Kenntniss des Caffeins. Freiburg, 1884. 8vo.
- SCHLICHTING, M.—Chemische Versuche einfachster Art. 8. Aufl. bearbeitet von A. Wilke. Kiel, 1885. 8vo.
- SCHLOESING, TH.—Contribution à l'étude de la chimie agricole. Paris, 1885. 8vo.
- SCHMIDT, E.—Anleitung zur qualitativen Analyse. 2. Aufl. Halle, 1885. 8vo.
- SCHMIDT, O.—Zur Kenntniss der Naphthol- β -disulfonsäure und ihrer Derivate. Freiburg, 1884. 8vo.
- SCHORLEMMER, C.—Origine et développement de la chimie organique. Traduit de l'anglais par A. Claparède. Paris, 1885. 12mo.
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- SCHROEDER, G. und J. VON.—Wandtafeln für den Unterricht in der allgemeinen Chemie und chemischen Technologie. Lieferung 2. Kassel, 1885. fol.
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- SCHÜTZENBERGER, P.—Traité de chimie générale comprenant les principales applications de la chimie aux sciences biologiques et aux arts industriels. 2. édition. Tome II. Paris, 1885. 8vo. 631 pp.
- SCHWEITZER, H.—Chlorkresole und ihre Oxidationsproducte mittelst Chromsäure. Freiburg, 1884. 8vo.
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- SMYTHIES, J. K.—Problems of the Motions of Atoms. London, 1885. 4to.
- SODEN, HUGO VON.—Ueber Triphenylphosphin und einige Derivate desselben. Leipzig: Reudnitz, 1885.
- SPELSBERG, EDUARD.—Weitere Untersuchungen über α -Aethyliden-Valerolacton. Würzburg, 1884.
- SPRING et WINSSINGER.—De l'action du chlore sur les combinaisons sulfoniques et sur les oxysulfates organiques. Liège, 1884. 8vo.
- STADLER, OTTO.—Zur Kenntniss der Mercaptane. Nitrirung des Thiophens. Zürich, 1885.
- STAMMER, KARL.—Chemical Problems, translated from the second German edition by W. S. Hoskinson. Philadelphia, 1885.
- STEGELITZ, P.—Ueber die Reductionsproducte des Chinolin-Aethylbromids. Freiburg, 1884. 8vo.
- STEIGER, A. VON.—Ueber die Entdeckung und Darstellung des Salvadorin, eines neuen Glykosids. Bern, 1885. 8vo.

- STOCKBRIDGE, H. E.—Ueber die analytischen Bestimmungen des Zuckers der Rübe mittelst älterer und eines neu construirten Apparates. Göttingen, 1885. 8vo.
- STOHMANN, F.—Handbuch der Zuckerfabrikation. 2. umgearbeitete Auflage. Berlin, 1885. 8vo.
- STÖHR, K.—Ueber die Hydroparafumarsäure. Kiel, 1885. 8vo.
- STORCH, V.—Mikroskopiske og kemiske Undersøgelser over Smørdannelsen ved Kjæningen samt Smørrets fysike og kemiske Sammensætning. Kjøbenhavn, 1885. 8vo.
- STRECKER, A., AND J. WISLIZENUS.—Organic Chemistry. Translated and edited with extensive additions by W. R. Hodgkinson and A. J. Greenaway. 2d edition. London, 1885. 8vo. 803 pp.
- Supplemento annuale alla enciclopedia di chimica scientifica ed industriale diretto dal Iellio Guareschi. Anno primo. Torino (December), 1884.
- TAPPEINER, H.—Anleitung zu chemisch-diagnostischen Untersuchungen am Krankenbette. München, 1885. 16mo.
- Technisches Centralblatt. Bd. III. Halle, 1885. 4to.
- Technisch-chemisches Jahrbuch, 1883-1884. Ein Bericht über die Fortschritte auf dem Gebiete der chemischen Technologie von Mitte 1883 bis Mitte 1884. Herausgegeben von K. Biedermann. VI. Jahrgang. Berlin, 1885. 8vo.
- THALÈS, R.—Sur le spectre du fer, obtenu à l'aide de l'arc électrique. Upsal, 1885. 4to.
- THOMSON, T.—Lærebog i uorganisk Chemi. 3. Udg. Kjøbenhavn, 1885. 8vo.
- TILLMAN, SAMUEL E.—Principles of Chemical Philosophy. [West Point, N. Y.] [1885.] 12mo.
- TRIMBLE, HENRY.—Practical and Analytical Chemistry, being a complete course in chemical analysis. Philadelphia, 1885. 8vo.
- TROOST, L.—Précis de chimie. 1^{re} édit. Paris, 1885. 12mo.
- URBAIN et ST. MEUNIER.—La chimie du charbon de bois, du noir de fumée et des combustibles minéraux. Paris, 1885. 8vo.
- URECH, FRIEDRICH.—Itinerarium durch die theoretische Entwicklungsgeschichte der Lehre von der chemischen Reactionsgeschwindigkeit. Berlin, 1885.
- VOGEL, A.—Zur Chininprüfung. [München], 1885. 8vo.
- VOIGT, R.—Ueber die durch Oxydation von 3-Collidin erhaltene symmetrische Pyridintricarbonsäure. Leipzig, 1884. 8vo.
- VOIT, C. VON.—Nekrologe auf J. G. von Jolly, J. B. Dumas, A. Wurtz, H. Kolbe, R. A. Smith und anderer. München, 1885. 8vo.
- VOIZ, O.—Beiträge zur Kenntniss der Naphthol-3 monosulfonsäure. Freiburg, 1885. 8vo.
- WAGNER, A.—Lehrbuch der anorganischen Chemie. München, 1885. 8vo.
- WARBURG, E.—Ueber die Elektrolyse des festen Glases. Freiburg, 1884. 8vo.
- WATT, A.—The Art of Soap-making: a practical handbook of the manufacture of hard and soft soaps. 2d edition. London, 1885. 8vo.
- WELLINGTON, CH.—Ueber die Einwirkung des Formaldehyds auf verschiedene organische Amine, sowie die Darstellung einiger sauren aromatischen Sulphate. Göttingen, 1885. 8vo.
- WELTZ, E.—Ueber einige Abkömmlinge der Chlor-nitrobenzole. Freiburg, 1884. 8vo.
- WENZLIK, C.—Ueber einige Derivate des Naphthochinons. Freiburg, 1885. 8vo.
- WILLIAMS, W. M.—The Chemistry of Cookery. London, 1885. 8vo.
- WITWER, W. C.—Grundzüge der Molecular-Physik und der mathematischen Chemie. Stuttgart, 1885. 8vo.
- WILBRAND, F.—Grundzüge der Chemie nach induktiver Methode. Hildesheim, 1885. 8vo.
- WISSE, J. F.—Ueber Butyrylanhydrometabromsodiamidotoinol. Göttingen, 1885. 8vo.

- WINKLER, C.—Handbook of Technical Gas Analysis. Containing concise instructions for carrying out gas analytical methods of proved utility. Translated, with additions, by G. Lunge. London, 1885. 8vo.
- WISLICENUS, WILHELM.—Ueber die Einwirkung von Cyankalium auf Phtalide. Würzburg, 1885.
- WISSER, Lieut. JOHN P.—History of Chemistry. Course of sciences applied to military art. U. S. Artillery School, Fort Monroe, Va., 1885. square 8vo.
- WOLFF, H.—Die Beizen, ihre Darstellung, Prüfung und Anwendung. Wien, 1885. 8vo.
- WOLFF, L.—Applied Medical Chemistry. A manual for students and practitioners of medicine. Philadelphia. 8vo.
- WORMLEY, TH. G.—Micro-Chemistry of Poisons, including their physiological, pathological, and legal relations. With an appendix on the detection and microscopic discrimination of the blood. New edition, revised and enlarged. Philadelphia, 1885. 8vo.
- WROBLEWSKI, SIGISMOND DE.—Comment l'air a été liquéfié; réponse à l'article de M. J. Jamin. Paris, 1885.
- WROBLEWSKI, SIGISMOND VON.—Ueber den Gebrauch des siedenden Sauerstoffs, Kohlenoxyds sowie der atmosphärischen Luft als Kältemittel. Wien, 1885. 8vo.
- WULF, PAUL.—Beiträge zur Kenntniss der fractionirten Destillation. Berlin, 1885.
- WURTZ, A.—Introduction à l'étude de la chimie. Paris, 1885. 8vo.
- WURTZ.—FRIEDEL.—Notice sur la vie et les travaux de Charles Adolphe Wurtz. Paris, 1885. 8vo.
- ZÄNGERLE, M.—Kemian alkeet. Porvoosa, 1885.

NECROLOGY OF CHEMISTS: 1885.

- THOMAS ANDREWS, born December 19, 1813, at Belfast; died November, 1885. He held the vice-presidency of Queen's College in Belfast, and was professor of chemistry in the same institution. His original researches, chiefly in physical chemistry, were numerous and valuable.
- EDW. H. VON BAUMHAUER, died January 18, 1885, at Leyden. He was born September 18, 1820, and for many years was professor of chemistry and pharmacy at Amsterdam. He held also the office of perpetual secretary of the Netherland Society of Sciences at Harlem.
- E. O. BROWN, died December 5, 1885. He was one of the chemists in the Royal Arsenal, Woolwich, under Sir F. Abel. His knowledge of the chemistry of explosives is said to have been unsurpassed.
- ARTHUR CALM, died in January, 1885. He was instructor in chemistry at the University of Zürich.
- JOHN CHRISTOPHER DRAPER, born March 31, 1835; died December 20, 1885. He held chairs of chemistry and of natural history in New York colleges, and published several text-books on physiology and chemistry. His original researches were chiefly in the domain of medical chemistry.
- HERMANN VON FEHLING, vice-president of the German Chemical Society, died July 1, 1885. He was born June 9, 1812, in Lübeck. In both research and literary work Fehling has left an enviable record.
- FREDERIC FIELD, one of the original members of the London Chemical Society, died April 3, 1885. He was authority on South American mineralogy, mining, and metallurgy, having resided in Chili for many years. His memoirs on different branches of chemistry are fifty-five in number.
- ALBERT FITZ, of Strassburg, died May 11, 1885. He was one of the pioneers in investigating the changes in organic bodies effected by microscopic plants.

- WALTER FLIGHT, born January 21, 1841; died November 4, 1885. Dr. Flight was for many years assistant in the mineralogical department of the British Museum. He published many valuable papers on the chemical composition of meteorites, and of the occluded gases contained in them. For a fuller biography, see *Nature*, XXXIII, 85.
- PHILIPP GREIFF, member of the German Chemical Society, died September 17, 1885. OTTO MENDIUS, of Ziegelhausen, died March 21, 1885. He was the author of the well-known "Mendius' Reaction," for converting nitrites into primary amines.
- HERMANN RÖMER, born October 31, 1848, at Mahlen, in Silesia; died in Berlin, January 27, 1885. He was instructor in the Technical School at Berlin.
- BENJAMIN SILLIMAN, born December 4, 1816; died January 14, 1885. He was one of the founders of the Sheffield Scientific School, and professor of chemistry in the Yale Medical School. For a full biography, see *American Journal of Science*.
- ALFRED TRIBE, died November 26 at the age of forty-six. His researches in conjunction with Dr. Gladstone have been numerous and important.
- WALTER WELDON, born October 31, 1832; died September 21, 1885, at his residence in Surrey. He was a most successful technical chemist, the author of the well-known "Weldon process" for regenerating the MnO_2 used in the preparation of chlorine. For fuller notice, see *Chem. News*, LII, 176.
- GEORGE WITZ, of Rouen, died June 17, 1885, aged 48 years. He made important contributions to the chemistry of cellulose.
- GUSTAV WUNDER, director of the *Technische Staats-Lehranstalten* in Chemnitz, died September 20, 1885. He was a member of the German Chemical Society.

